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November 1988

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGA

Canada $3.75

Soaring Fun-Fly Coverage

Scale Color Documentation

CONSTRUCTION: MISTRAL, T-Tailed, Technology Trainer

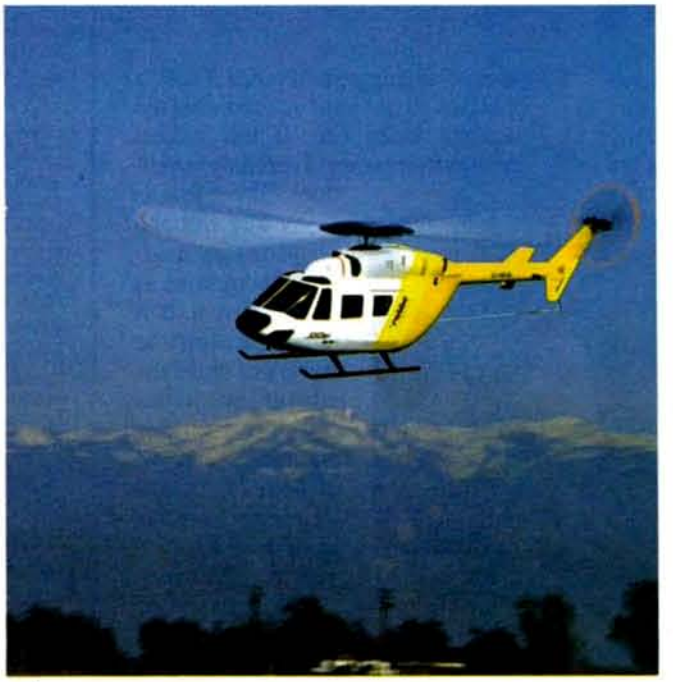
Vintage R/C Organization

F&B: Pilot Loadstar
Robbe BK-117 Heli
Sig Spacewalker

MODEL AIRPLANE NEWS

NOVEMBER 1988 VOLUME 116, NUMBER 11

MODEL AIRPLANE NEWS



ON THE COVER:
Gracing this month's cover is the Pilot Loadstar, a multi-use large-size platform that opens up many new, exciting vistas for the R/C flier to explore. This one was built by Dick Purdy, and you'll find his comments on the kit in this issue. It's presently "on-loan" to *MAN* for use as a glider launch vehicle. Kodachrome by Rich Uravitch.

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

Model Airplane News (ISSN 0026-7295) is published monthly by **Air Age, Inc.**, 251 Danbury Rd., Wilton, CT 06897. Second class postage paid at Wilton, Connecticut, and at additional mailing offices. Subscription rates are $25 for 1 year (foreign $33), $47 for 2 years (foreign $63), $65 for three years (foreign $89). **Postmaster:** Send Form 3579 to **Model Airplane News**, P.O. Box 428, Mount Morris, IL 61054.

Editorial

by RICH URAVITCH

OCCASIONALLY, but unfortunately not that often, something really exciting comes along that catches my attention; something I get enthusiastic about because I consider it new, innovative, revolutionary, or just plain interesting. It may be a new material, like carbon fiber or CA, a new process, like the composite make-up of the EZ-type ARFs, a new competition like "Top Gun," or any of the exciting new kits.

As infrequent as *these* occurrences are, they might just be considered routine when compared to the contents of the package that just arrived. It contained a wing section, lovingly clad in foam. So what, you say? How about an all-metal, built-up *scale* wing section? How about if that wing section would ultimately become part of a colossal, ¼-scale R/C P-51 Mustang? As part of your P-51 refresher course, a ¼-scale Mustang spans a bit more than nine feet!

The name of the outfit is Warbirds, and it's headed by an energetic, professional model-maker by the name of Gary Lavarack. He told me of the project some three months ago and said he would forward a wing panel subassembly in 90 days. So far, he's right on schedule! The picture will give you an idea of the detail and fabrication method used in the kit. Gary reports that the wing skins will contain all the surface detail embossed, chem-milled or etched. The all-up weight is projected to be 25 to 27 pounds, and power will come from a Sachs 4.2 turning a scale 34-inch propeller through a belt drive. This project must have cost a small fortune in tooling alone! The price for the kit will be around the three grand mark, to which you'll have to add the price of an engine and radio. That's a bunch of geetas until you see what the package looks like. If this project reaches fruition, and I certainly hope it does, I'd bet that as many kits will end up as display models without skins as will be flown. If it doesn't, it won't be due to lack of enthusiasm or *chutzpah* on Gary's part. It takes enormous amounts of both to embark on a project like this as a commercial venture. I sure wish him the best and will keep you advised of the progress. For those interested in obtaining your own serialized kit, or additional information, contact him at 122 Naubuc Ave. (NAP Bldg.), Glastonbury, CT 06033, (203) 659-1920.

If that's not enough, how about the U.S.'s first practical-sized, working turbojet engine suitable for models? It has been developed by Bryan Seegers of Phoenix, AZ, and has been frequently demonstrated to the public. The demo airframe was designed by Jim Allen, who also handles the flying chores. The basic engine weighs 5.6 pounds and is 11.5 inches in length (less inductor section), with a combustor section diameter of 5.5 inches. It burns argon-pressurized unleaded gasoline at a rate of 3 gallons per hour and delivers 11 pounds of static thrust at 69,000rpm! Bryan expects 14 to 15 pounds when he turns the wick up to 80K.

The present test airframe externally pods the engine, not unlike the old Midwest Jetster/Ryan Compass Cope configuration. It spans 8 feet with 1550 square inches and has a dry takeoff weight of 24 pounds, plus 3 more for the ½-gallon of fuel. We hope to have a complete story for you in the near future.

No one can say this hobby is boring! ■

MODEL AIRPLANE NEWS

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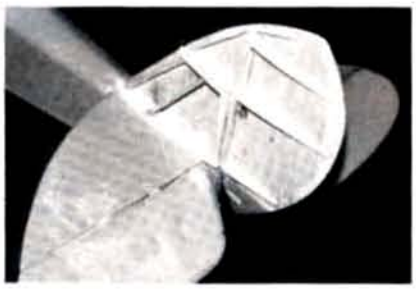
Airwaves

Trim as Required

Looking over some of the back issues, I came across Mike Lee's "Pattern Matters" (January '88) in which he refers to airfoils of tail sections, etc.

I have a Unionville Tigermoth, powered by an Enya .60 4-cycle, which I fly regularly with much satisfaction. I encountered many trim problems during take-off and landing, and it seemed like I was going to wear out the rudder trim control when a brainstorm hit me.

During the war, the Messerschmitt had similar problems—the pilot had to hold constant left rudder, varying the pressure with the power settings in order to fly straight. Consequently, many pilots got a sore left leg during dog fights and lost because of this, until some bright engineer figured out that airfoiling the left side of the rudder only would overcome this problem.



I have applied the same theory to my Tigermoth rudder (which was previously just flat ¼-inch balsa sheet) with remarkable results. No longer do I have to keep fiddling with trim. From idle to full power, it flies straight, and overshoots and aerobatics aren't so scary. Another way of overcoming the torque would be to link rudder trim to the throttle, but this is much more complicated. I found airfoiling only the left side of the rudder so useful that I'm trying it on my other models.

FRED RACE
British Columbia, Canada

Fred, I'm afraid you've lost me in your description. Your photo shows an airfoil created on the left side of the rudder which now creates a lifting surface. Since the right side (or "bottom") of this surface is flat, and your airfoiling has created a camber on the "top" surface, the lift generated would move the tail to the left, or towards the cambered surface. Since the tail of your Moth is conventionally located, this would cause the nose to swing to the right in the yaw axis. It seems to me that application of left rudder would only be an opposing force to the right yaw resulting from your airfoiled vertical surface. Since lift has a direct relationship to speed, I'm a little surprised that you're getting the results you describe. I would have thought that with the airfoiled surface, as you increased airspeed you'd be required to do more "fiddling with trims," because of the power/trim sensitivity that frequently results when improper engine-thrust settings (offset) are used, requiring the airplane to be re-trimmed whenever different power settings are selected.

I'm glad, however, that it's working for you. Anyone else out there come up with similar findings?

RAU

Received the following news from our own Jim Newman, which should interest you helo historians. RAU

Fairey Rotodyne

On page 61 of the August '88 issue, Dick Sarpolus asked if the Fairey Rotodyne was ever built. If it wasn't, then I'd like to know what it was that was practically blowing out my office windows back in England.

Yes, indeed, the Fairey Rotodyne *was* built, in prototype form at least, and not the Z Model wearing British European Airways colors, shown in the photograph. The prototype looked very similar, flew extremely well and eventually went on to set a new world record in the closed 100km circuit class at 190.9mph. The concept of the compound, convertible helicopter was used by Fairey Aviation Co. to overcome the present

(Continued on page 10)

Airwaves

limitation of the powered rotor in providing 100 percent of the lift, in which the true air speed of the retreating blade decreased as the forward speed of the helicopter increased. This caused severe vibration and rolling as the retreating blade approached stalling speed. The company overcame the difficulty by reducing the rotor load (hence lowering its stall speed) by providing a small wing to carry as much as 50 percent of the load. The concept was proven originally in the much smaller Gyrodyne, which, in 1948, set a new world helicopter record of 124.3mph. The compound helicopter powered the rotor for takeoff; then, once forward speed was achieved and the wing provided lift, the power was gradually removed from the rotor, which was then allowed to autorotate at nearly zero incidence. Much higher cruise speeds could be achieved than were thought possible. What a challenge for the scale buff!

The interesting point about the Rotodyne was the method of powering the rotor: The tips of the rotor contained very small pressure jet units. In those very early days (1957) of relatively limited helicopter technology, Fairey overcame the tremendous difficulty of perfecting a transmission capable of absorbing a continuous 6,000hp, and also eliminated the need for the complex rotor hinging common today. In addition to providing forward thrust through conventional propellers, the pair of Napier gas turbines were tapped at takeoff and landing to provide compressed air out to the tip jets which, when the rotor was turning, *sounded* as though they were firing every 180 degrees. In truth, they burned continuously, like a blow torch. The resulting "explosions" were devastating in terms of decibels, and whenever the rotor test rig fired up about 200 feet from my office at the Aeroplane and Armament Experimental Establishment in England, the switchboard would light up like a Christmas tree as the local populace from five or six miles around voiced their objections. As the rotor turned, the noise was similar to an enormous steam locomotive, and it got louder as the rotor speed increased. The concept was brilliant and ably demonstrated the genius of the Fairey company engineers, but in today's EPA-regulated atmosphere, I doubt very much if the project would have got off the ground—literally. Nevertheless, this fascinating 70-seat airbus foundered, not for lack of technology, but because of poor management.

Jim Newman
Hobart, IN

Zeppelin in Concert

In 1940, I made my first move in modeling airplanes. World War II put a damper on that till this year.

I have entertained the thought of building a Zeppelin about 10 or 20 feet long. I understand some have been seen around the country.

Can you assist me in obtaining addresses of these builders so I can get started in fulfilling a long-time desire?

KEITH BLUST
176 W. Prairie
Stockton, IL 61085

Mr. Blust, we're printing your entire address to enable anyone involved in a similar project to contact you directly. Interestingly, we receive letters like yours from other modelers, so we can only assume something *must be going on with blimps, dirigibles, and zeppelins. How about it folks, fill us in!*

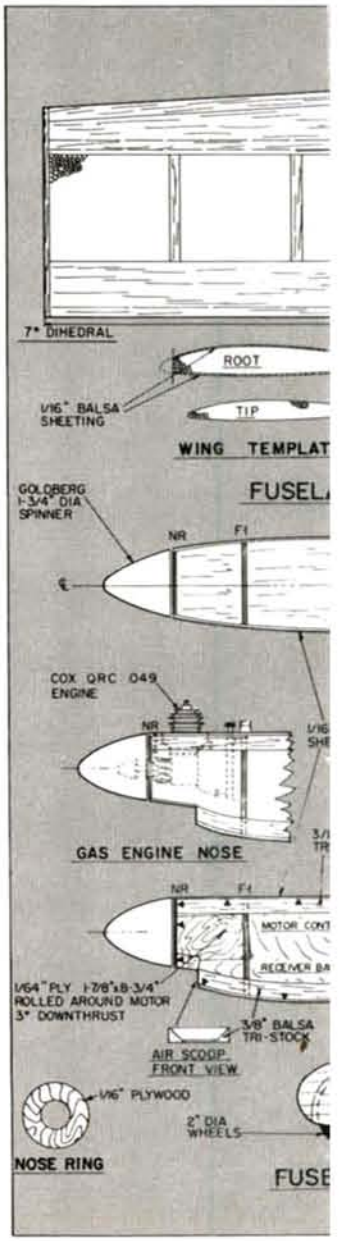
RAU

A Puristosnob?

I resent being labeled a puristosnob. When people tell me that they would like to get started in R/C helicopter flying, my reply is that they'll need about $1,500 to get started ($1,000 for the machine, $200 for tools, starter, etc.,

(Continued on page 68)

Norm demonstrates proper launch attitude. Since wing loading is high when all the batteries are on board, a good hard throw will provide a margin of safety.



MISTRAL

by NORMAN ANDERSON

ALL AIRPLANE DESIGNERS start with certain goals in mind, and I'm no exception. With the Mistral, I wanted to try some of the newer construction materials and techniques available, but I didn't want to spend a lot of money. I wanted a sort of inexpensive "technology trainer." I also wanted something that would encourage me to improve my flying skills. With a growing family, I seem to have less and less time to spend on my hobby, so it also had to be quick to build. By using electric propulsion made for a quiet airplane, more flying sites would be available to me, and so the Mistral was born.

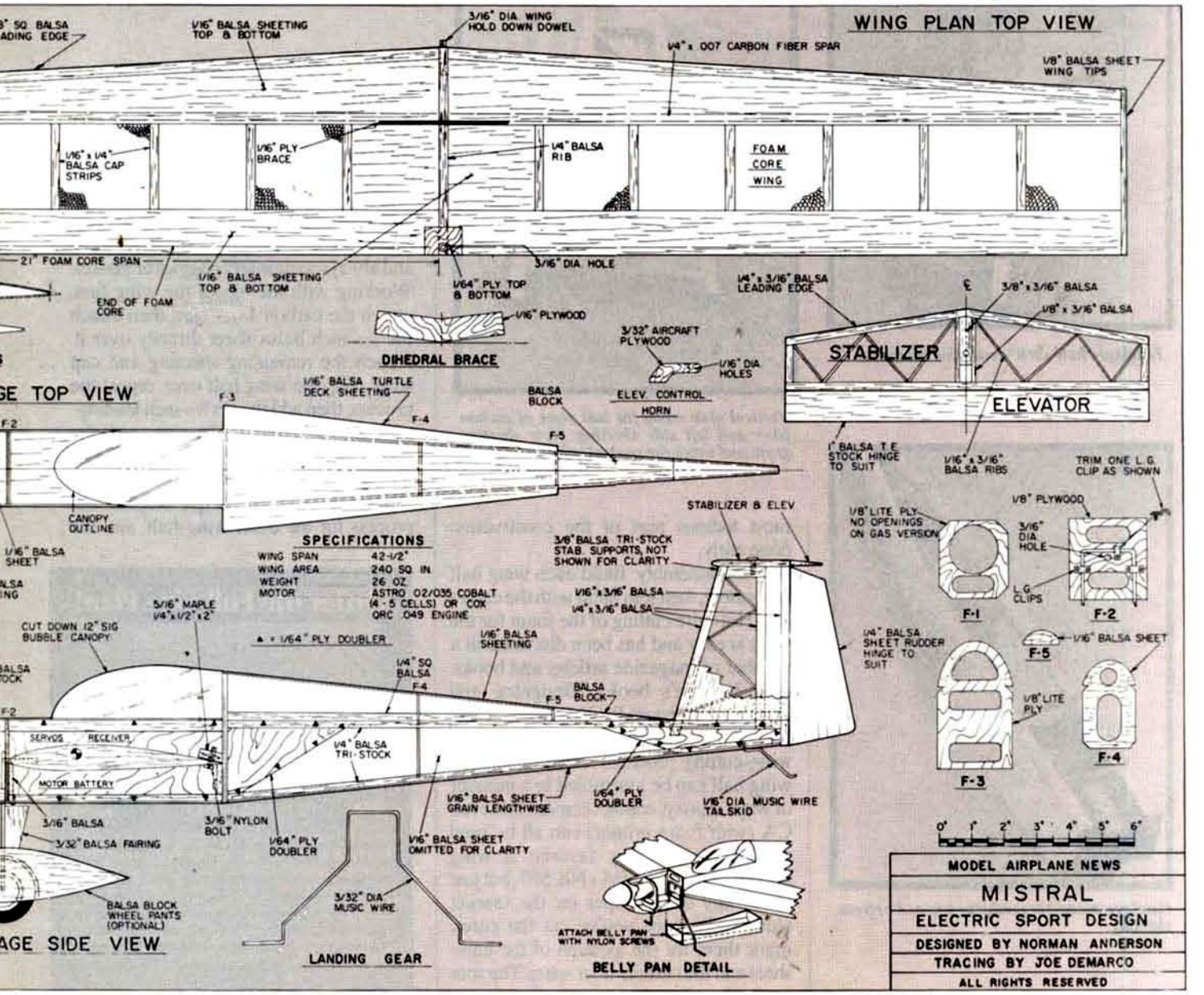
SMALL FIELD FLIER THAT ALSO SERVES AS A "TECHNOLOGY" TRAINER

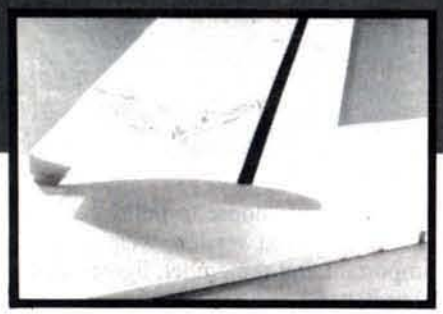
The mid-wing, rudder/elevator design makes for a sporty model that retains the forgiving nature of dihedral. The longer-than-average tail-moment arm makes the Mistral more stable than similar-size models, while it remains responsive. The wing loading ensures good penetration in wind and makes everything happen more quickly. This all adds up to a design that should satisfy either someone looking for an advanced trainer, or a Sunday flier who wants a fun airplane to learn about carbon fiber, sheeted foam wings and electric power.

CONSTRUCTION: Enough of the design philosophy; let's get into the construction. While looking over the plans, notice that the Mistral is designed to be light, as this extracts the maximum performance from the electric motor. The motor compartment is sized to accept the Astro* Cobalt 020 and 035, and, although the motor mount can be modified to accept other motors, performance may suffer. If you choose to build the glow-engine-powered version, weight isn't as important, but remember, lighter always flies better.

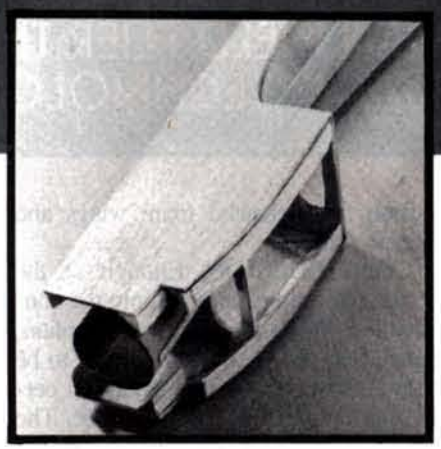
The best approach to scratch-building is to make your own kit containing all the parts (wing cores, fuselage pieces, etc.) that you'll need to construct the model. Because the wing/fuselage interface is somewhat more critical in the Mistral than in most other models, the wing should be built first. This also gets the

FULL-SIZE PLANS AVAILABLE . . . SEE PAGE 140.



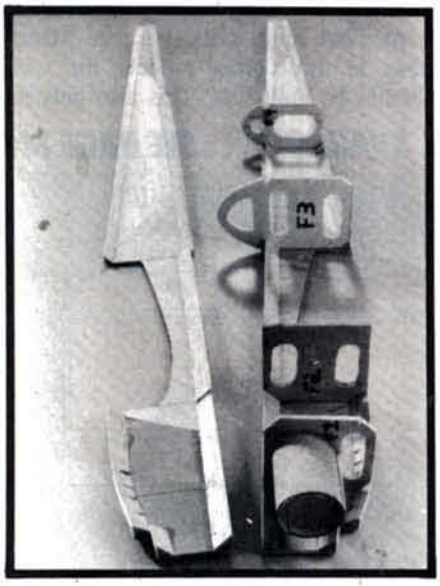


Foam wing core with carbon fiber/spar attached.

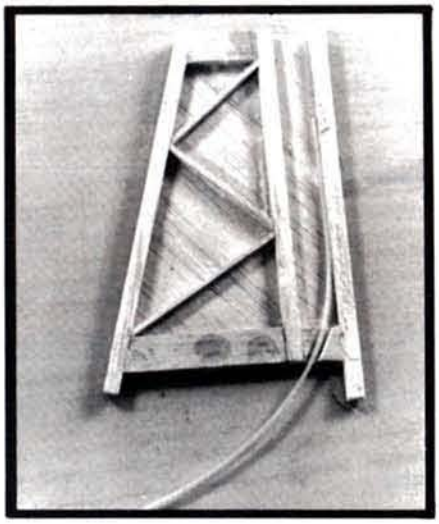


Close-up of forward section shows motor mounting tube.

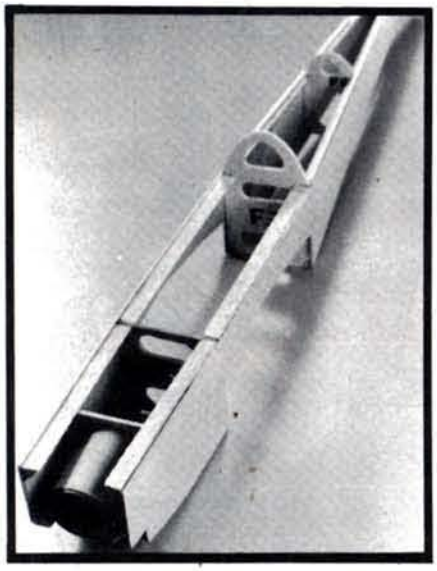
Close-up of assembled, covered tail. Note placement of plywood control horn.



Fuselage "half shell" ready for assembly.



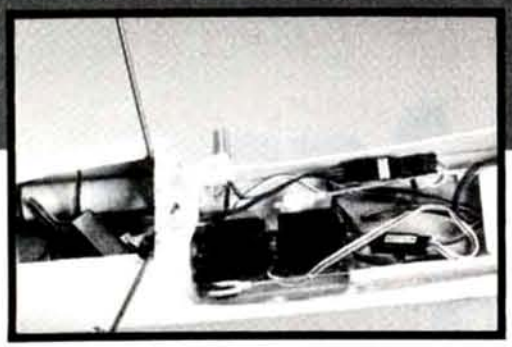
Vertical stab ready for last piece of carbon fiber and left side sheeting. Note sheeting grain and notch for control cable.



Fuselage assembly ready for top and bottom sheeting.

most tedious part of the construction done early.

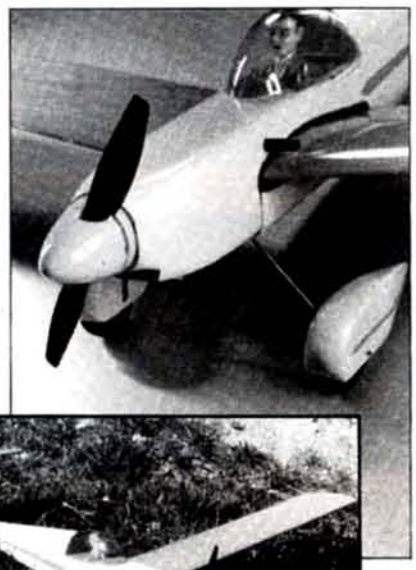
• Wing assembly: Build each wing half separately, then join them with the center rib. (Hot-wire cutting of the foam for the wing is easy and has been discussed in a number of magazine articles and books. Jack Lambie's book, "Designing and Building Composite R/C Model Aircraft," has an excellent description of the foam-wing-cutting process.) The rest of each wing half can be assembled in a number of ways. Epoxy, contact cement and even CA (with foam primer) can all be used successfully, but my favorite is wing sheeting tape. I use 3M's No. 507, but just about any of the tapes on the market work well. Once you've cut the cores, mark them for the location of the balsa sheet and the carbon-fiber spars. The spar material can be bought pre-cut to width, so all you have to do is to cut the strips to length. The easiest way to cut them is to heavily score them with the hobby knife on both sides, then snap them into two pieces over a sharp corner. Whenever you're working with carbon fiber (or any hobby material) be very wary of splinters, and always wear safety goggles or glasses. Working with the top of the wing first, attach the carbon-fiber spar, then attach the 1/16-inch balsa sheet directly over it. Attach the remaining sheeting and cap strips. Flip the wing half over, repeat the process, then add the 1/4x3/16-inch leading-edge piece. If you do this step with the core resting on the foam bed made during the cutting process, you'll be assured of a true wing with no warps. Repeat this process for the other wing-half, and the



Fuselage with all radio components installed and ready to fly. Even with a "mini" airborne system, space is at a premium, but careful planning should allow for a clean installation. Note that the aileron function is connected to the rudder servo; just fly it like an aileron ship! A phono plug is used for receiver on/off switch.

wing is nearly done!

Sand a 3½-degree angle into each wing-half root. Notch the ¼-inch balsa root rib for the ⅛-inch leading-edge hold-down dowel and install the dowel. Attach the root rib to one wing-half and notch the wing-halves for the dihedral brace. Assemble the two wing-halves and dihedral brace with epoxy, with one tip propped up 3 inches. Sand the leading edge to shape, and install the 1/64-inch ply squares to the top and bottom of the trailing edge. The last messy step is attaching the 2-inch fiberglass tape to the center section. To save weight, CA can be used for attaching the tape to the sheeting. Drill the bolt hole in the trailing edge, cover the wing and install the dowel in the leading edge. For its looks, I used MonoKote* to cover the wing, but Micafilm is lighter. The wing is finished! If you use fast-curing glues, this whole process should take only one evening.



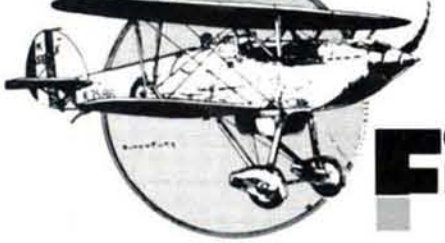
• Vertical and horizontal tail assembly: The horizontal tail is assembled in the standard manner for built-up structures. The

(Continued on page 70)

Completed Mistral, ready to take wing. Although ROGs are possible, a very smooth runway and quick reflexes would be necessary. Best to use a hand-launch.

MATERIALS

Quantity	Dimensions	Material
Wing		
2	1x7x21-inch	Foam core
2	1/16x1/4x36-inch	Balsa cap strip
3	1/16x3x36-inch	Balsa sheet
1	3/8-inch-diameter	Hardwood dowel
2	3/8x36-inch	Balsa leading edge
	1/4x.007-inch	Carbon fiber strip
	1/4x1x12-inch	Balsa root rib
	1/8x1x12-inch	Balsa tip sheet
2	1 1/4x3/4x1/64-inch	Plywood bolt-hole doubler
	1/16x1-inch	Aircraft plywood dihedral brace
Fuselage		
3	1/16x3x36-inch	Balsa fuselage sides, top and bottom
3	1/4x36-inch triangle	Balsa reinforcement (square may be substituted)
1	1/4x1/4x36-inch-square	Balsa reinforcement
2	3/8x36-inch triangle	Balsa reinforcement
	1/16x4-inch	Balsa turtle deck
1	4x5x1/8-inch	Light-plywood formers
1	3x3x1/8-inch	Aircraft plywood formers
	1/64x6-inch	Plywood doublers and motor tube
	1/4x1/2-inch	Maple wing hold-down
1	12-inch	Sig* bubble canopy
1	1 3/4-inch-diameter	Goldberg* spinner
Empennage		
	1/4x3-inch	Balsa rudder
	1/4x.007-inch	Carbon fiber strip
	1-inch	Balsa trailing edge stock elevator
2	1/4x3/16x36-inch	Balsa stock
1	1/16x3/16x36-inch	Balsa
	3/8x3/16-inch	Balsa
	1/2x3/16x36-inch	Balsa
	1/32x3x36-inch	Balsa sheet
Landing Gear (optional)		
2	2-inch-diameter	Light Wheels
	1/16-inch-diameter	Music-wire tailskid
	3/32-inch-diameter	Music-wire main landing gear
3		Landing-gear hold-down straps
Miscellaneous		
1	020/035	Astro Flight cobalt motor
4/5-cells	900mAh	Motor batteries
1	3-channel	Radio control system with lightweight airborne system
2		Superflex control cables (Goldberg)
2	3/16-inch	Nylon bolts



Fifty Years Ago . . .

by STAFF

THE AWESOME Messerschmitt BF-109 fighter graced the cover of *Model Airplane News* 50 years ago, this month. This plane was one example of Germany's rapidly growing air power. As *MAN* noted, the BF-109 had been introduced two years earlier at the Zurich International Air Meet. At that time, the Messerschmitt took part in the military competition and easily won all four categories. *MAN* reported that Major Al Williams of the USA had recently toured Europe and was given the privilege of being the only pilot outside the German Air Force to fly the Messerschmitt. After the flight, Williams stated, "I believe the Messerschmitt is the fastest and most maneuverable fighting plane in the world."

Robert C. Morrison's column, "Frontiers of Aviation," at one point sounded as though it was written for November *1988*, not 1938. Morrison referred to all the new facilities the airlines were building to handle their rapidly expanding business. He said, "At Chicago, United Air Lines has just completed a large main operations building...." If you've been through O'Hare in 1988, you'll know United is still building!

The "Gas Lines" column reported on the Greater Chicago Gas Meet. Fewer than 10 of the 157 entrants failed to make an official flight during the eight-hour event. George Herbert had built a model of the Taylor Cub using *MAN* plans, and he said it was the most successful and sturdiest ship he'd ever built. A full-scale set of building drawings for a 1919 Nieuport was also included in the November issue. By following the detailed instructions, the reader could easily build and fly this plane.

George Herbert built this Taylor Cub in 1938, using Model Airplane News *plans.*

As always, *Model Airplane News* was filled with technical articles to keep readers informed. Practical aspects of model flying were covered in "Getting The Most From Your Models," which contained the following timeless advice: "Before a flying session, a check should be made of all equipment. Do you have a complete tool kit with repair materials? Do you have enough spare parts?" How many times in the past 50 years have flying sessions been cut short because this advice wasn't heeded? "Designing Your Gas Model Props" contained a pair of helpful charts; information on physics in the "Airplane" column provided a more in-depth study of full-scale aeronautics, and this could be applied to scale aircraft as well.

One of the ads in the November '38 issue was for Berkeley Model Supplies, which featured its record-setting Buccaneer 48. The kit contained everything except the motor and the landing gear, and it sold for only $2.95 with the postage paid. In 1988, $2.95 probably wouldn't even cover the cost of postage.

A 640hp engine gave the Messerschmitt BF 109 a top speed in excess of 260mph.

The 1919 Nieuport was used as a pursuit plane in World War 1.

During the past 50 years, model airplane flying has come a long way, and, just as we did in 1938, *Model Airplane News* continues to keep modelers at the leading edge of technology. ■

Pattern Matters

by MIKE LEE

SINCE I ALWAYS try to bring you product news from the pattern world, here's the latest on Phillips Aircraft Co.*—a supplier of fiberglass and foam pattern birds. This company now makes the popular PA-2 (a fiberglass version of the Aurora), the Philare (an Atlanta look-alike), the Mistress (by David von Linsowe), and the Conquest (by Dave Patrick).

All these ships are constructed of fiberglass and foam, powered by .60-size engines and made for AMA and FAI competition. I've had the pleasure of flying the Conquest and the PA-2, and both fly well. The Conquest is a constant-speed aircraft with an incredibly long tail moment, and it's very stable in pitch and yaw, with a nice rapid roll. The PA-2 flies like the original Aurora (the PA-2 is a clone of the original). Prices hover around $150 for the basic plane (no wood or hardware), and custom units are available at around $350.

The Mistress, by David Von Linsowe, is now kitted by Larry Phillips Aircraft Co. The kit is a foam and fiberglass ship, available in basic and custom versions.

Cables

My latest handy-dandy hint comes to you from the fishing tackle store, and concerns the pull/pull cables used for rudders and elevators on our ships. I was looking for some cable to make one of these hookups, and I decided to ask around to see what everyone else is using. Most said their cable came with the kit or gave me some other useless info. I finally got the answer from a fellow who works at the hobby shop, who told me that the cable is stainless-steel fishing-leader material, which can be found at bait and tackle shops.

Sure enough, a quick look in the fishing tackle place revealed an abundant choice of cables, including plastic-shielded cable. For my Aurora, I chose 10-pound test stainless with plastic shield, and some soft-steel ferrules to secure it. The cost was $3, and I have enough left for five more planes. There are other leaders available, but I prefer the stainless steel, as it will stretch very little over time and absolutely resist corrosion. Try it out and, while you're at it, pick up a couple of lures and live bait to go fishin' after you fly.

Asano Propellers

Those of you who've been looking for the expensive and very hard-to-find Asano laminated propellers will be pleased to hear that there's a new source. Powermaster Products, Inc.* (makers of model aircraft fuels), now carries finished and unfinished Asano laminated props. Powermaster carries the more popular sizes used by pattern people, and these range in diameter from 11 inches to 14 inches. Pitch sizes range from 9 through 12 inches, in ½-inch increments, and special sizes are available on request. Prices average about $15 for unfinished blades, and $32 for finished blades, and for more information, you can contact Powermaster.

Happy Landings

Let's talk about landings. I realize that we're all experts at getting our birds down in one piece, but what about expert *enough* to score high in front of the judges? Let me describe my landing method; it might help you.

Our ships are pretty slick and aerodynamic, and they display abnormally good glide rates. For their size and weight, they glide pretty far, and if you let them, they'll also maintain a pretty high air speed. For me, the key to a good landing is getting the ship to slow down.

To see how slow the ship will go for shooting a landing, I usually take it up topside for some slow-speed flight. I try to fly the ship as slowly as possible, without letting it stall, and this means a high angle of attack along with a certain amount of throttle. Add throttle and I can climb; decrease throttle, and the ship descends, but *under full control.* I note the throttle setting and angle of attack, plus any tip-stalling tendency. Now to shoot the landing.

I start with the standard rectangular approach—same as the retract pass to final in a contest. On the downwind leg, I throttle down, pop the gear, and start slowing it...immediately! This gives me

(Continued on page 22)

(Continued from page 20)

plenty of time to slow the ship gradually and to establish the previously noted angle of attack and throttle setting. By the time you've reached the crosswind leg, your ship should be almost fully slowed and in a controlled descent to final. From here, the glide path can be stretched or shortened by using the throttle. You shouldn't use the elevator, as dropping the nose will increase the air speed and cause you to overshoot. Pulling on the elevator will only cause a vicious stall. *Use the throttle!* As you ease through to final, the ship will be easy to level out to the runway and you'll establish the line to the spot landing. From here, you may only have to worry about keeping the wings level and hitting the spot. Throttle control will hit the spot and ailerons will adjust the wings. Perform final flare, and you've touched down like a feather.

Remember that in this process, letting the nose drop will only increase the air speed; the ship becomes aerodynamically efficient and must be slowed again. This "again" time may occur sometime after it has passed you on the runway. Very few ships today are dirty enough to prevent them from increasing their efficiency when the nose drops. And don't forget that our ships tend to be large, and they need room to recover from stalls. Although most of them will really go a long way in the angle-of-attack department before they stall, they *will* stall at some time. It's pretty traumatic when 8 to 9 pounds of airframe hits the deck! Find that happy medium up topside, and remember it. Use it for that landing approach, and you'll increase your judged points, and airframe life, too.

Dave Patrick proudly displays his Conquest aircraft for FAI, now kitted by Phillips Aircraft Co. Made in fiberglass and foam, this ship has been making tracks in the contest circles with its smooth style and docile flight habits.

Trusty Tires

Some time ago, I mentioned that many of us have turned to foam tires for our aircraft. To recap: We're using them because they really absorb the shock of landing, and they're also very light. Admittedly, they may not last quite as long as a good solid rubber tire, but the advantages of shock absorption and lightness seem to be a fair trade-off.

Polk's/Model Craft Hobbies* has a line of tires called Feather Flite Airplane Tires. The tires are standard plastic rims wheel-mated to heavy-duty sponge-rubber tires, which are very similar in consistency to the rubber R/C road-racing tires. I've been using these tires on my Atlanta for the past year, and I've given them the acid test. They've held up quite well, and at the modest price of about $4 a pair, they're quite a bargain.

Plane Pain

My final tip this month concerns the proper treatment of your airframe. Most of the planes flown today are pretty darn strong, and I estimate that the average airframe can withstand stress about 12 Gs positive and 10 negative. A quick calculation shows we're talking about an 8.5-pound ship weighing about 100 pounds at the bottom of a 12-G square corner. Since I don't want to put 100-pound weights on my wings just to see if they'll hold up, I'd prefer to be a bit more cautious in the flight department, and so avoid ever having to find out the hard way.

Many pilots unreasonably stress their ships. Sure, it's no big deal to do a split-S way out yonder at full power, but some pilots just yank the poor fella through the split-S as if they're performing a stress test. I think you should inflict as little stress on an airframe as possible. Throttle back on maneuvers that don't require the coals to be burning hot. Ease off the gas when heading downward in a sharp dive, and most important, be smooth on the sticks. Sudden control inputs can snap even the strongest wing joints, including fiberglassed ones. The message here is clear: To prolong the life of your airframe, never overstress and be smooth on the sticks.

I'm sure we're looking forward to an exciting end to 1988, with the famous Tournament of Champions in Las Vegas, NV. Will an American finish first again, or will Hanno Prettner make his comeback? How will the new Ultimate biplane fly the Aresti maneuvers? Will the monoplanes get completely wiped out by the bonus points for bipes? The event should be a real eye-opener for us all, and *MAN* will be there to bring you the details. Till then, we're winding up the pattern season in the Midwest and East, and the Sunbelt States are just getting ready for the winter season. The newer all-turnaround pattern contests are catching on, and I'll bring you news on these affairs. Meanwhile, we're on the pipe and airborne.

**Here are the addresses of the manufacturers mentioned in this article:*

Phillips Aircraft Co., Harvey Rd., R.D. #1, Box 544, Williamsport, PA 17701.

Powermaster Products, Inc., 10103 Freemount Ave., Sante Fe Springs, CA 90670.

Polk's/Model Craft Hobbies, 346 Bergen Ave., Jersey City, NJ 07304. ■

1988
MID-COLUMBIA

In Washington, "P.S.S." could mean Prodigious Scale Soaring.

SOARING SCALE FUN FLY

Wil Byers puts his all into launching Pete Bechtel's CS-77.

by WIL BYERS

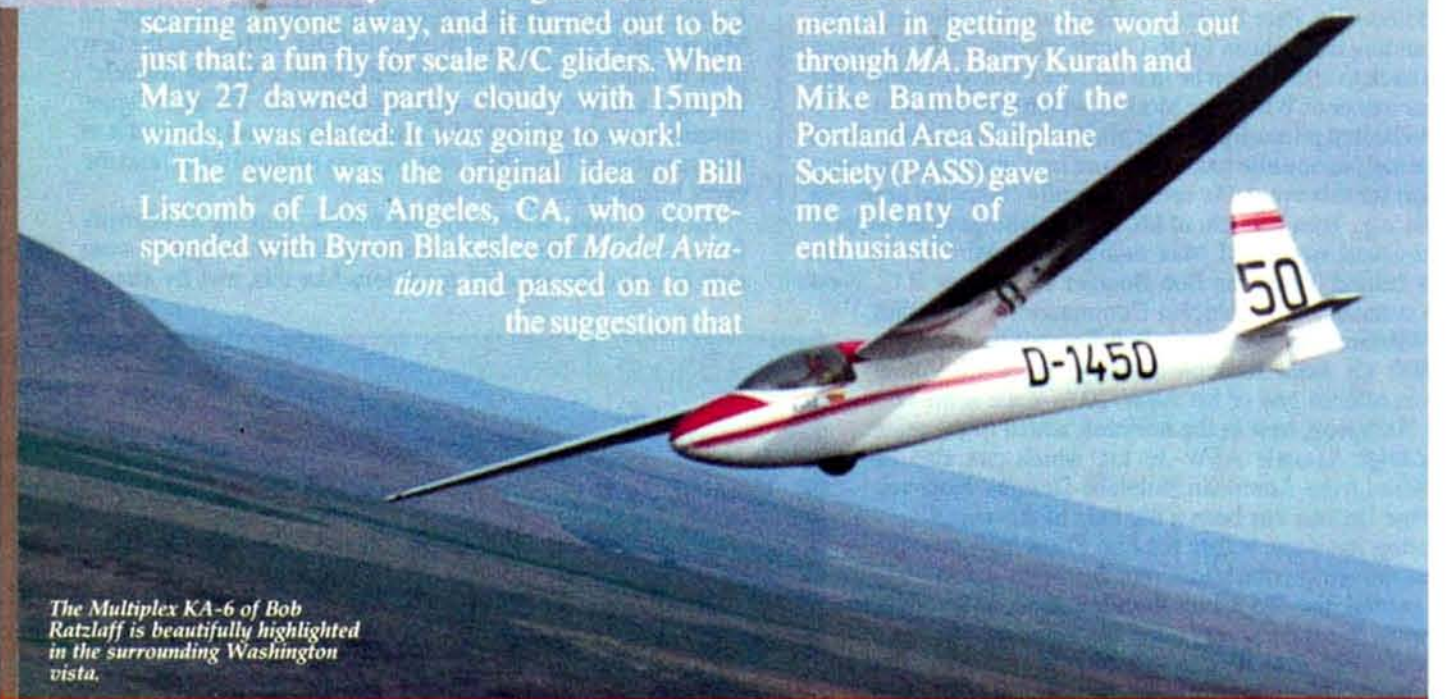
THE FIRST SOARING Scale Fun Fly on Memorial Day weekend, 1988, was memorable for all participants. It was a unique event in R/C because of the special people who participated and introduced many of us to a singularly different kind of soaring: scale slope soaring. What an introduction it was! Whether one's interest is in sleek soaring machines, gliders from days long past, or even fast, exciting, power slope scale jets, it was an experience to be savored.

This event had been planned for over a year, and its success was due to the positive input of many interested individuals who are dedicated to the furtherance of our great hobby. These are people who think as I do and who wanted to see this event succeed

Above: *Beautiful CS-77 built and flown by Pete Bechtel. Note wind indicator on antenna.* Left: *Bill Liscomb and friends keep watchful eye on ASK-21 and ASW-20.*

and, most of all, to see R/C scale soaring finally become an established part of soaring. So it was billed as a Fun Fly and nothing more, to avoid scaring anyone away, and it turned out to be just that: a fun fly for scale R/C gliders. When May 27 dawned partly cloudy with 15mph winds, I was elated: It *was* going to work!

The event was the original idea of Bill Liscomb of Los Angeles, CA, who corresponded with Byron Blakeslee of *Model Aviation* and passed on to me the suggestion that such an event needed organizing. Well, the rest is history! Byron is a friend any event organizer would love to have, as he was instrumental in getting the word out through *MA*. Barry Kurath and Mike Bamberg of the Portland Area Sailplane Society (PASS) gave me plenty of enthusiastic



The Multiplex KA-6 of Bob Ratzlaff is beautifully highlighted in the surrounding Washington vista.

Erick Eiche's SG-38. "Vintage" soarer launched here by Wil Byers, Bill Kuhlman and Roy Bunnell. Beautiful work!

encouragement early on. They helped me realize that scale soaring's time had come, and that if our club could organize such an event, it would be a success.

Additionally, Pete Bechtel stands apart from the rest in his outstanding enthusiasm for R/C scale soaring. His experience dates back to 1967, when he first became involved, and he's the former owner of Windspiel Models, which was started in 1976 and dedicated primarily to scale gliders—and obviously ahead of its time! No one else has spent more time and money gaining support for this event. He enthusiastically contacted generous people, e.g., Tom Kikuchi of J.R. Radios who gave his support and donated two PCM Max radios and a MiniNumbus kit. Right behind Tom was Bob Boomer of Beemer R.C. West (who contributed a Multiplex Commander PCM radio) and Wilshire Model Center's Bob Ratzlaff (who gave a D6-600 kit from Multiplex). Jerry Slates of Viking Models offered one of his ASW-20 1/5-scale semi-kits. Gary Anderson, new in the business, added to the prize list a huge 1/3-scale ASW-20 kit, which can also be purchased from American Sailplane Designs. Now you see; Pete Bechtel has been a big help to this event!

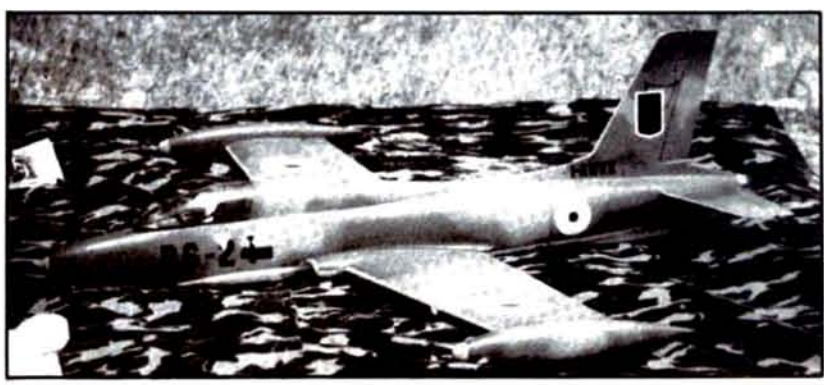
During the week before the Fun Fly, a high-pressure system moved into the Mid-Columbia basin and winds in and around the Tri-Cities became light and mostly northerly. We have a very good north-facing site, and I was confident that if these conditions continued, the participants would be able to fly, but I was also sure that the heavy machines would be grounded.

So, at all costs, I avoided watching the weather forecasts and hoped my prayers would be answered. I also hoped the Battelle weather people would be right. Their statistics, dating back to 1942, showed that one could expect an average of 27 windy days in May, with winds averaging 10.1mph. Thursday arrived, and the calm began to give way to a southwest wind at 15mph. A front was pushing in, just as I'd hoped.

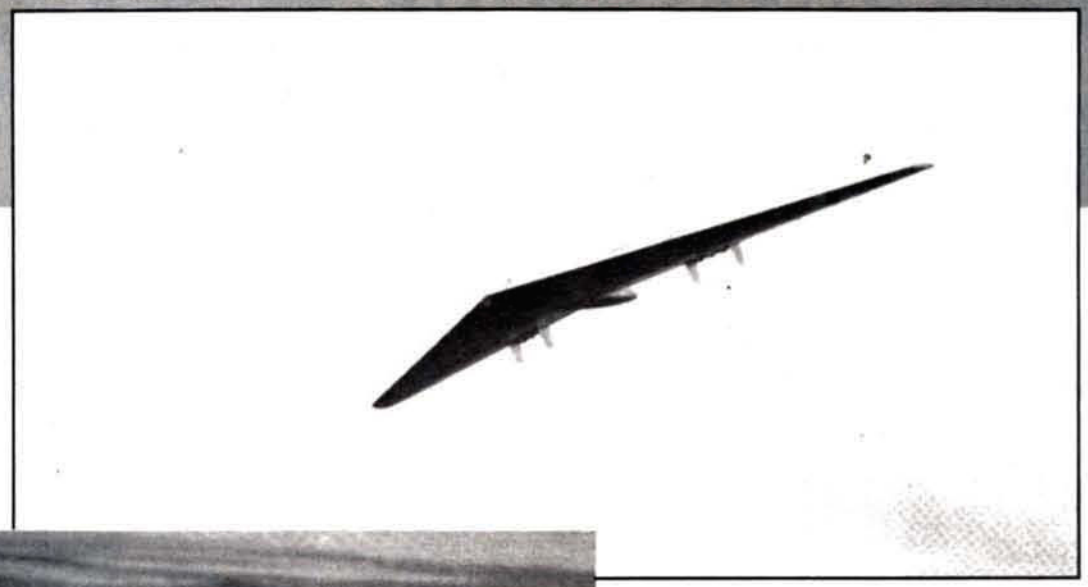
Bill Liscomb arrived on Wednesday night and dropped by for a map so that he might enjoy some pre-event soaring. Things were beginning to mesh, and we all looked forward to Thursday night's registration. This went as planned, and was followed by an early Friday morning registration organized by Julie Waddoups (the wife of our club president) who did a great job. When registration was complete, 58 pilots and more than 100 gliders were ready to fly—a good turnout for the first year.

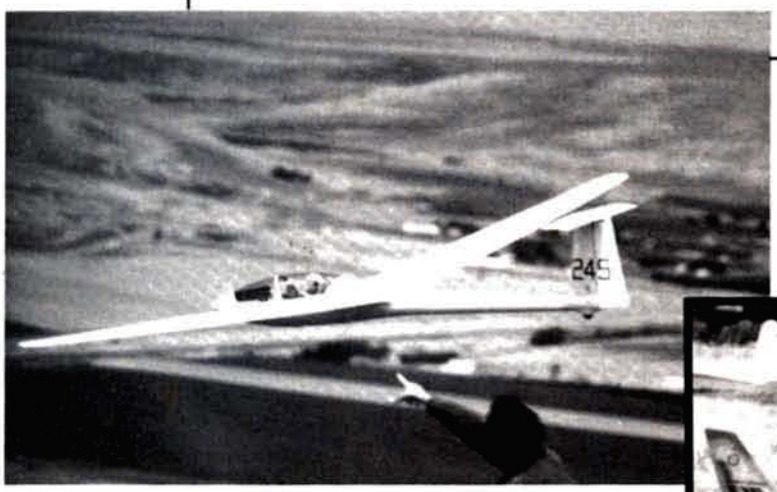
Friday dawned with partly cloudy skies and winds of approximately 15mph. It appeared that we'd have good thermal development as the temperature was 70°F and heading for the 80s. Frequency control was implemented by 9 a.m., with Barry Kurath acting as frequency-control person. Gene Cope of Marysville, CA, with his fully detailed DG-101G, was the first pilot to launch. His plane was built from a Viking Models* fuselage and plans, with some modification. His pilot figure consulted a map of the Mid-Columbia basin and returned it to the map pouch. The pilots' meeting was held at 10 a.m. and the event formally got underway.

All day, winds were very dependable, ranging in intensity from about 10mph to gusts reaching 40mph. All pilots were able to make the most of conditions like this, and fly almost



Brad Smith's Aermacchi MB-339 with its ordnance removed. This machine was a standout! Single-place light attack version of type flown by full-scale Italian team, "Frecce Tricolori."





Above: *Northrop YB-49 from the Seattle Area Slope Soarheads. B-2 next?*
Left: *Ray McGowan's Jantar I, launched by Mike Bamberg.*
Below: *Byron P. Bruce with his Combat Models F-16s. This guy could really pilot these gliders!*

anything. Brad Smith, from Fremont, CA, was airborne very close behind Gene Cope with a fantastic Aermacchi. It sported full ordnance which, when removed, allowed this machine to really perform. Brad is no slouch, and he coached the Macchi to really attack the air with great rolls and loops. The Idaho boys, led by Ed Mason, flew great little P-51 penetrators, and Ed flew a Micro-Mold U-2 from Wilshire Model Center. Pete Marshall anxiously eyed the lift, waiting for the right moment to launch his highly modified, smartly detailed, Combat Models F-16. Bill Liscomb had an ASW-20 from Glas Flugel that ate huge holes in the sky. He also had an ASK-21 that was unique not only because it was a two-place glider, but also because it has three landing wheels. (I was privileged to fly it.) A Multiplex KA-6 was commanded by Bob Ratzlaff and

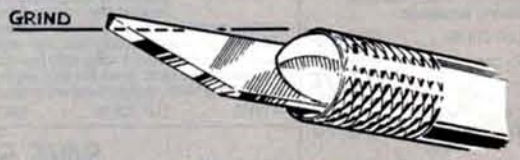
(Continued on page 80)

Erick Eiche with his beautiful Reiher from the Krick kit.

H.M. Broadbent brought his colorful T6-3 all the way from Winnipeg, Manitoba, Canada.

Hints & Kinks

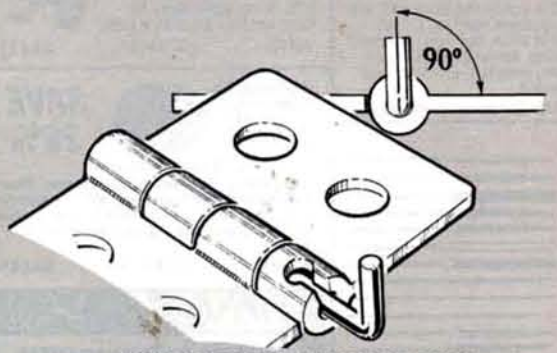
by JIM NEWMAN



RE-POINTING BLADES

It's easy to knock the point off your favorite No. 11 blade and still leave a useful edge, but it's equally easy to restore it. Do not use a power grinder, as this will burn the tip and destroy the temper. Instead, use a hand grindstone, rub the rear edge of the blade back and forth as marked on the drawing, and finish off with a fine oilstone until you have that delicate point once more.

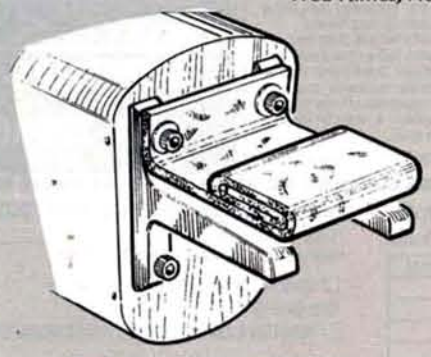
Jay Wallace, Ashland, OR



QUICK-RELEASE HINGE PINS

This was used on ¼-scale hinges, but could be used on smaller sizes. The system allows the ailerons to be completely finished and painted before attachment, and to be removed for repair, yet they're securely held by the click-fit feature. The hole must be drilled at 90 degrees to the hinge blade (so that the hinge wire sits vertically between the aileron and the wing), while the slot is cut just a few thousandths of an inch narrower than the diameter of the hinge wire. The wire can only be removed with a firm pull.

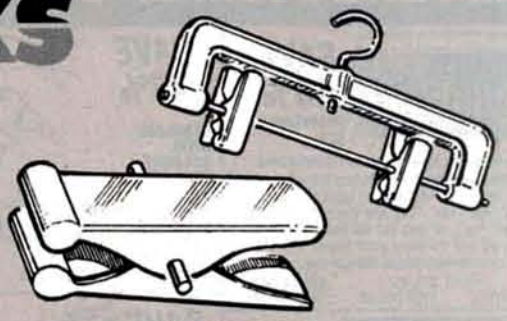
Fred Himes, Neeses, SC



SECURE NOSE WEIGHT

Short-nose models require nose ballast; it should be located as far forward as possible and bolted securely to solid structure—**not to the cowl.** This shows how ⅛-inch sheet lead bolts to the engine-mount bolts and extends forward under the engine. In this position, it can be trimmed as required to move the CG back.

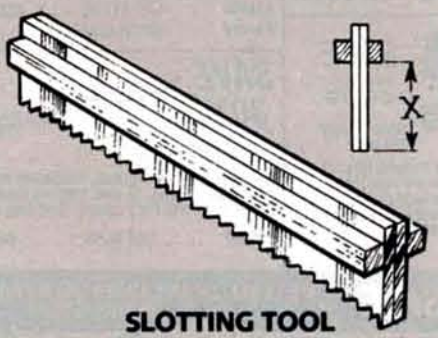
Ron McCabe, Madison, WI



SPRING CLAMPS

Those skirt and slacks hangers are molded in a brittle plastic that breaks easily. When it does, save the clamps. These rubber-tipped metal items have powerful springs. Cut the wire rod to leave a little of it projecting from each side of the clamp and, if desired, epoxy a small nut or washer to each side. These clamps are useful when laminating plywood fire walls.

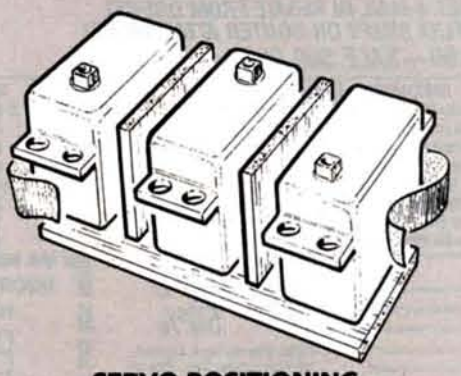
Dennis Bryant, Burgess Hill, Sussex, England



SLOTTING TOOL

An old idea that's still useful enough to warrant repetition. This tool is for notching ribs and formers for spars and stringers. Laminate as many sections of fine-tooth hacksaw blades as necessary, using thin card shims between blades for final sizing of slots. Tape or CA the blades and shims together and add the two slot depth-control strips. Test on scrap wood before commiting the tool to the work piece.

Bob Peterson, Youngstown, NY



SERVO POSITIONING

If space is confined, tape your servos together, along with suitable spacing shims, also adding a bottom shim. Be sure to have the rubber grommets in place on each servo. Set the cube of servos into the fuselage, then carefully fit the wooden servo mounts around them and secure with a spot of CA. Spot-mark through the grommets, remove the cube, drill the mounts, remove the tape and mount each servo individually. With this technique you'll find each servo properly spaced and aligned in spite of the cramped quarters.

Dan Scott, Hubbard, OH

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o **Model Airplane News**, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

Build and fly your own aerial recon platform

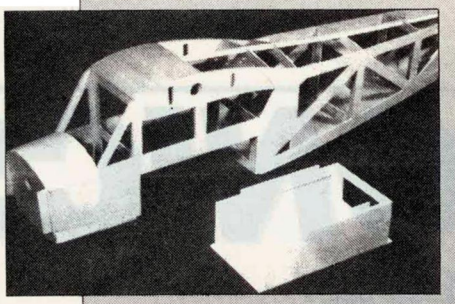
by DICK PURDY

PILOT LOADSTAR

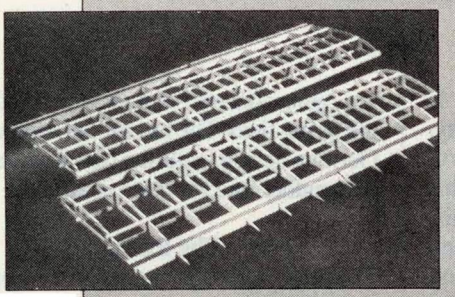
from Hobby Shack

THE PILOT LOADSTAR has turned out to be a happy surprise for me, and I'm anxious to share the fun! Although not excited when I first saw its picture on the box (just another ho-hum airplane, sez I to me) my experience flying it has been anything but routine. If you're looking for off-beat adventures in this hobby, read on!

Pilot Loadstar is kitted by OK Model Co. in Japan and distributed in the U.S. by Hobby Shack*. The plane is designed to perform several special acts, all of which entail carrying a load aloft for a specific function. The carrying capacity is 5½ pounds, and this means you can fly a video camera around the pea patch. A still camera can be



Simple basic fuse construction. Payload box is removable.



High-quality, die-cut wing panels prior to joining.

Loadstar performs a slow, flaps-extended fly-by. Easily hovered in a slight headwind.

SPECIFICATIONS

Type: *Special use and sport plane*
Span: *77 inches*
Weight: *8 pounds*
Wing Area: *945 square inches*
Wing Loading: *19.5 ounces/square foot*
Power Required: *.40 to .45 2-cycle; .60 to .90 4-cycle*
Radio: *5 to 6 channels: throttle, rudder, elevator, aileron, flaps, and accessory actuator.*
Suggested Retail Price: *$186.95*

easily fitted into the fuselage... or a multiple parachute drop ... or other bomb drops can be rigged up. Finally, there's a glider-launching cradle that can be bought as an optional add-on. This feature allows you to fly a glider to a launching altitude that's well above the usual limitations of a high-start-type device.

"A rewarding flying experience...a ton of fun!"

In general, the kit was complete and of top-quality components. The items not supplied are those not usually included in any kit: covering, engine, radio, fuel tank, wheels and adhesives. However, the kit does include a very sturdy engine mount that adapts to several engine sizes. This is a generous-size bird when complete, and to pull it around, I opted for a 4-cycle O.S.* Max 90 FS, which fit the mount and plastic cowling nicely. The wing loading is 19.5 ounces per square foot, which accounts for its ability to carry the 5½-pound supplementary payload.

CONSTRUCTION: The fuselage is built first, being assembled from die-cut plywood sides and interlocking formers. Balsa is used to sheet the bottom and around the nose area, while the top is an open framework covered by the covering film of your choice. There's a removable box built into the fuselage; it's located at the center of gravity and carries the camera or other payload. The space provided for the payload is 4½x8¼x6 inches, as the internal controls have been laid out to leave this much space open. The payload box

(Continued on page 87)

G-Series Futaba transmitter appears small when positioned next to the big Loadstar. Great combination.

Taxiing by, the Loadstar resembles full-scale Pilatus Porter or Helio Courier. Wing struts are functional.

AIRTRONICS

AT LAST, A RADIO SPECIALLY EQUIPPED FOR THE GLIDER RIDERS!!

by JOHN LUPPERGER

THE AIRTRONICS* NAME is synonymous with high-quality, innovative products for the R/C soaring enthusiast. Over the years, this company has brought us many fine sailplanes, accessories and R/C equipment. When Lee Renaud was alive and running the company, he was considered to be one of America's premier glider designers, and his designs are still being flown and enjoyed by both beginners and competition pilots. His wife, Barbara, and sons Bob and Tim, still run the company; they've upheld his ideals of excellence and quality in every product they sell.

The Module Series R/C Systems consists of four radios that share certain design features, although each one is designed to fly a particular type of aircraft. This review will deal with the 7SP model, which is designed for use in multi-channel, high-performance-style gliders. This isn't a *technical* review, like those written by radio experts, but it *is* a *user's* review. I'll go over the specifications listed by the manufacturer, but the real substance of this review will be on how the radio operated in a specific model at the flying field. The test model used was a German design featuring full-span flaperons, rudder and elevator controls.

The Radio

The radio comes packaged in a compartmentalized foam carton that protects it during shipping. You receive: a 7SP transmitter (in reality, a 6-channel unit); an 8-channel receiver; four servos; airborne Ni-Cd; switch harness; servo tray; servo hardware; neck strap; and dual charger.

The transmitter features include: 500mW output; gimbals with adjustable tension and stick length; ratcheted trims; battery voltage meter; elevator and aileron dual rates; LCD digital timer; servo-reversing for all channels; servo travel adjustments on the three primary controls; plug-in RF module; plug-in battery; multiple mixing and trim adjustments.

The 8-channel receiver features: dual conversion, narrow-band, frequency modulation; 20KHz adjacent channel spacing capability; gold-plated connectors; and

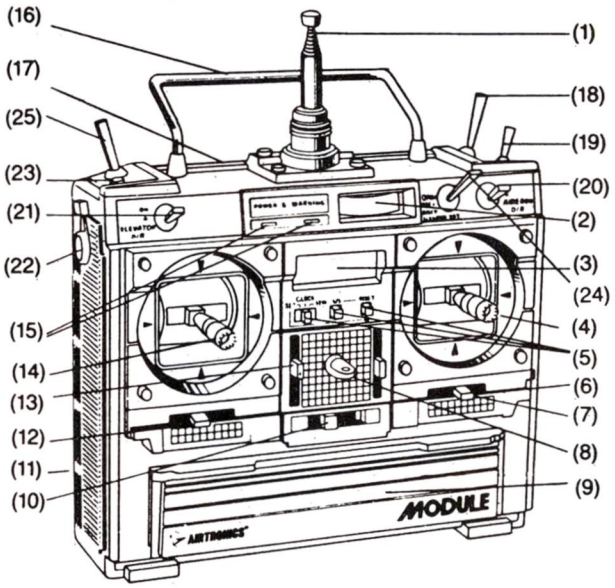
Airborne consists of four servos, receiver, battery and switch harness. Although the components are all standard size, they'll fit in most sailplanes that use a radio of this type.

The transmitter case is surprisingly uncluttered for a radio with so many bells and whistles.

Carry-handle makes it much easier to move the radio around without the danger of hitting various switches.

SERIES 7SP MODULE

RADIO



1. Retractable antenna
2. Power meter
3. Digital LCD timer
4. Control stick, horizontal ailerlons, vertical throttle (Mode one), elevator (Mode two)
5. Timer control switches
6. Trim lever, ailerons
7. Trim lever, throttle (Mode one), elevator (Mode two)
8. Neck-strap connecting hook
9. Trimmer cover
10. Power switch
11. Charging jack (rear)
12. Trim lever, rudder
13. Trim lever, elevator (Mode one), throttle (Mode two)
14. Control-stick, horizontal rudder, vertical elevator (Mode one), throttle (Mode two)
15. Power and warning LED lamps
16. Carrying handle
17. Frequency module (rear)
18. Flap-mixing switch
19. Retract-gear switch
20. Ailerons dual-rate switch
21. Elevator dual-rate switch
22. Auxiliary channel lever
23. Stopwatch start/stop
24. Elevator pre-set trim switch
25. Aileron/rudder mixer switch

plug-in crystals. It measures 2⅜x1⅜x¾ inches and weighs 1.8 ounces. The radio's original 7-channel receiver has been replaced with an 8-channel unit, which is reputed to be a better unit.

The four 94551 servos are ball bearing with 47.5 ounce/inches of torque, and a transit time of .5 second for 90 degrees of travel. They measure 1.46x.75x1.44 inches and weigh 1.87 ounces. The airborne Ni-Cd measures 1¼x1¼x2⅝ inches and weighs 4 ounces. Its capacity is 500mAh and it's square in configuration.

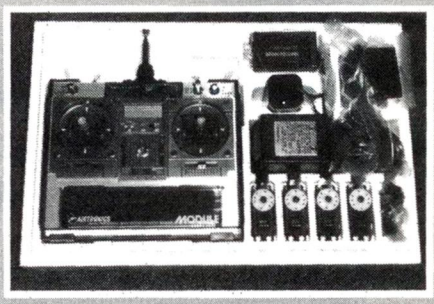
The Test Model

The test model was the Caramba—an F3B-style glider from Germany, featuring full-span flaperons, rudder and elevator controls. The model was also flown with coupled aileron and rudder. Overall, fuselage design is rather slim, and I was initially concerned as to whether or not the standard servos would fit. They're slightly taller than the servos that were previously mounted in the model. The

(Continued on page 89)

Frequency module is located on the back of the transmitter and can be changed quickly and easily.

The author with the multi-channel F3B-style test model. The Caramba uses full-span flaperons, rudder and elevator controls.



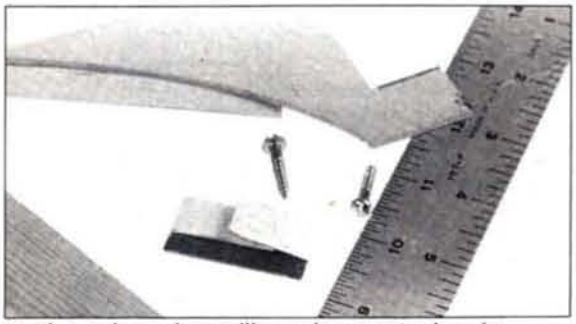
Right out of the box, the 7SP is complete with everything you need.

How To:

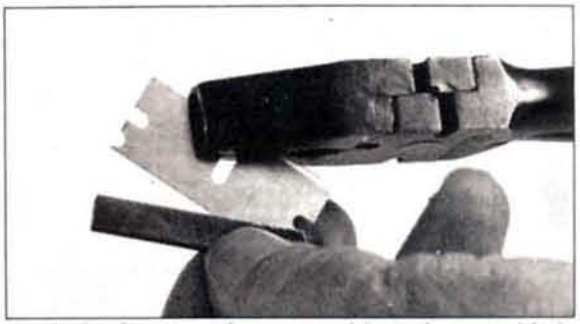
by RANDY RANDOLPH

MAKE A BALSA STRIPPER

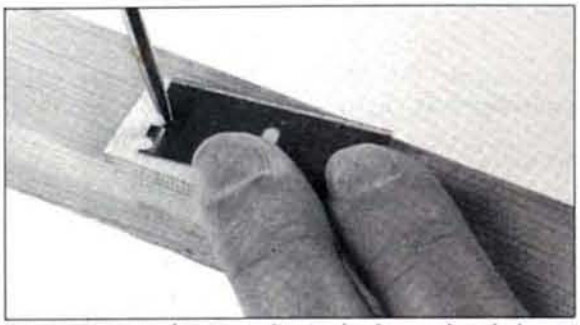
A balsa stripper is a tool that every modeler should have. Strips for spars or longerons can't be accurately matched unless they come from the same sheet of wood, and the best way to do this is with a balsa stripper. This stripper has one advantage over the several commercially made models—cost! The photos show the way.



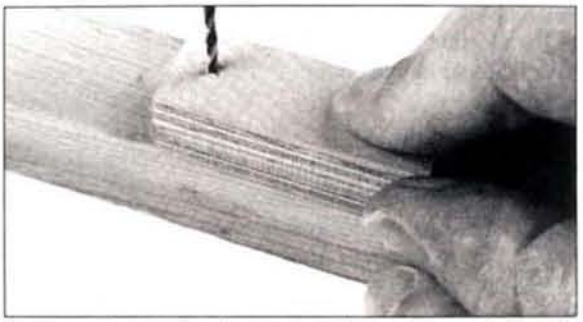
1. The only tools you'll need are a single-edge razor blade and a ruler. Materials: a 6-inch length of 1x2-inch hardwood for the base; several scraps of plywood, ranging in size from 1/32 to 1/4 inch; and two 1/2-inch No. 6 wood screws.



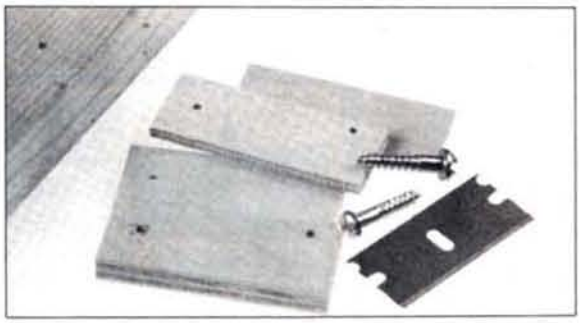
2. The backing must be removed from the razor blade. Grasp the blade with a pair of pliers and wedge a screwdriver between the backing and the pliers. Once loosened, the backing is easily removed.



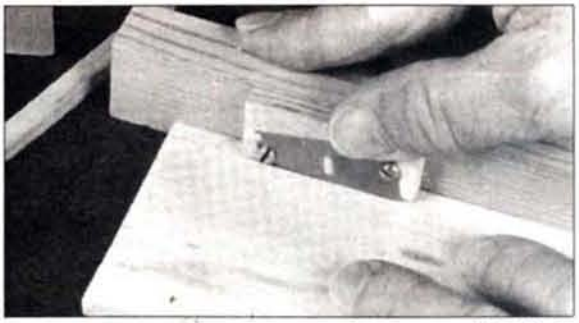
3. Cut a 1x2-inch piece of 1/8-inch plywood and place it on the hardwood base so that the long side is slightly more than 1/4 inch from what will be the bottom of the base. Position the razor blade at an angle so that one end of the blade is even with the bottom and the other is even with the edge of the plywood. Mark the location of the blade notches on the plywood.



4. Cut other 1x2-inch pieces of 1/32-, 1/16- and 1/4-inch plywood. Stack them with the marked 1/8-inch piece on the base, in the same location as above. With a 3/32-inch drill, drill *all* the pieces at the marked locations.



5. Enlarge the holes in the plywood shims to 1/8 inch so that the screws will slip through with a close fit. The shims provide the adjustment necessary to cut strips 1/32, 1/16, 3/32, 1/8, 5/32, 3/16, 7/32 and 1/4 inch wide.



6. Place plywood shims between the base and the blade to provide spacing for the width of the desired strip. Screw the blade and the shims into the base. Hold the base firmly against the side of the balsa sheet while stripping. A 1/4-inch sheet is the maximum size that can be easily stripped with a stripper of this type.

SIG MANUFACTURING

SPACE WALKER

Sig's Sassy Sweetheart Should Satisfy Serious Scale Sawyers

by CHRIS ABATE

TO SOME, THE NAME Spacewalker might evoke thoughts of Neil Armstrong, our first astronaut to walk on the moon, but to the home-built crowd, the name immediately evokes thoughts of Jesse Anglin's latest design—the Spacewalker. Jesse is a veteran designer of home-builts, and now Sig Manufacturing* has produced a 1/3-scale kit of the Spacewalker.

Let's talk about how the approximately 529 parts went together. To begin with, only two parts were found to be mislabeled: the W-4A aileron ribs, which were marked W-3A. Not bad! Only .4 percent wrongly marked parts, and by the time this was noticed, Sig had already notified *MAN* of the problem and a revised instruction booklet was on its way. The 31-page booklet is packed with photos, illustrations and text with step-by-step instructions. The only thing lacking is a Sig representative to build the model for you!

CONSTRUCTION: Before building the wing, you'll have to make a very important decision: whether to build it in one piece or in three pieces. The choice is yours, and both options are fully explained, but Sig and I suggest that you construct the wing in three parts, because we're talking about a wingspan of 104 inches—that's 8 feet *plus!* Ignore this advice if you have a stretch limo or a large motor home in which to transport the plane to the flying field. Since Sig has made the effort to capture full-scale construction techniques, it's a waste if you don't duplicate the prototype. Also, in making the wing in three pieces, the center section can stay bolted to the fuselage, which makes it easier to transport, as it can stand on its own wheels. Back to the wing assembly.

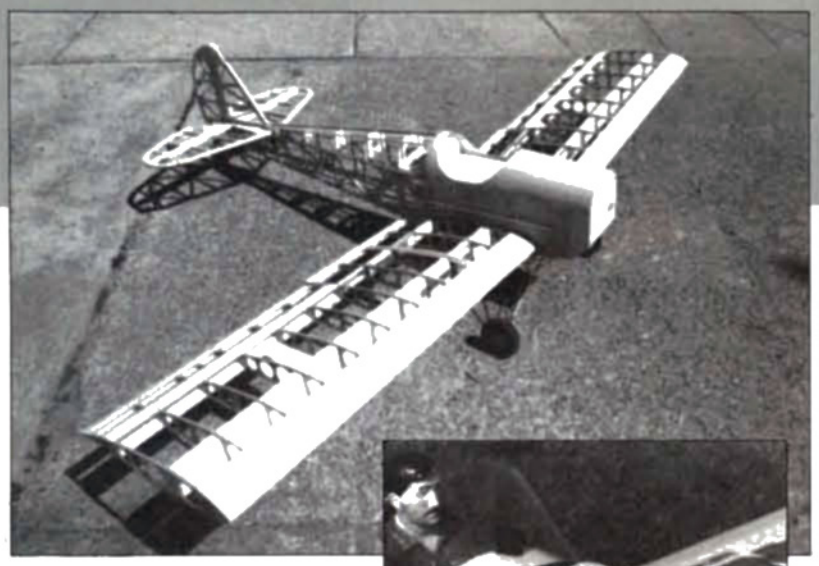
The wing main spars are of laminated spruce with lite-ply shear webs running the full length on both the front and the rear of the main spars, as well as the center

SPECIFICATIONS

	Full-Size	Model
Wingspan:	26 feet	104 inches
Wing Area:	117 square feet	1,800 square inches
Wing Loading:	5 pounds per sq. ft.	1.3 pounds per sq. ft.
Length:	18 feet	72 inches
Weight:	589 pounds	20 pounds approx.
Engine:	65 H.P. Continental	1.5-2.4 cubic-inch 2-stroke; 1.8-3.0 cubic-inch 4-stroke

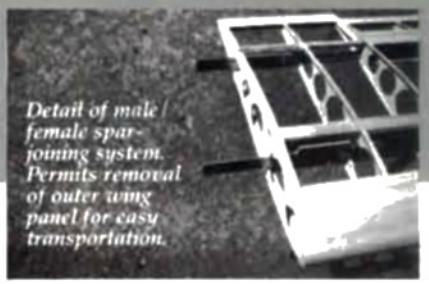
section. As you build each wing panel, you'll also be building half of the center section, so when the aluminum wing-joiner spars are attached, you'll have a perfect alignment of outer panel to center section. Yes: There are two wing-joiner spars that attach to the front and rear spars. (Note photo.) A 3-inch-wide sheet of balsa takes care of the leading edge (top and bottom), and a 1½-inch-wide balsa sheet does a similar job for the trailing edge.

As the wing is constructed, so are the ailerons, which are then cut out later. Again, you have a choice of aileron length. This is fully explained in the instruction book. Balsa cap strips are used top and bottom on each rib. Wing construction is very simple (don't let the size scare you), and it produces a strong unit. All ribs are die-cut lite-ply, and a number of lightening holes were cut to reduce weight. For those of you who think this doesn't help, I weighed



Bare-bones framework, ready to cover. Beautiful kit is a real lumberyard!

Fuel-cap cover is removed for actual refueling. Nice scale touch.



Detail of male/female spar-joining system. Permits removal of outer wing panel for easy transportation.

The Saito 2.70 4-stroker supplied plenty of power.

the cutouts; close to ¾ pound was removed. (Thank you, Sig.) This is a weight saving that can compensate for that 1200mAh battery pack.

You must choose an engine before starting construction, as your choice will directly affect the length of the fuselage. There are a number of viable options, and the choice is yours.

Before you hit the panic button, you'll notice that Sig shows several different engine installations and gives you plans for each one. If you have to wait to sneak a few more bucks out of the cookie jar to buy your engine, this is very helpful as you can continue construction *without* the engine. As you can see, I opted for the Saito* 2.70 twin engine, as it not only has good characteristics, but with the cylinder

SIG SPACEWALKER 3X

by RICH URAVITCH

Above: *Hazel Sig in her Spacewalker at Fond du Lac, WI, near Oshkosh. The airplane drew lots of attention from EAA attendees.* **Right:** *Instrument panel from Hazel's Spacewalker. Compare this to model version by Chris Abate on next page.*

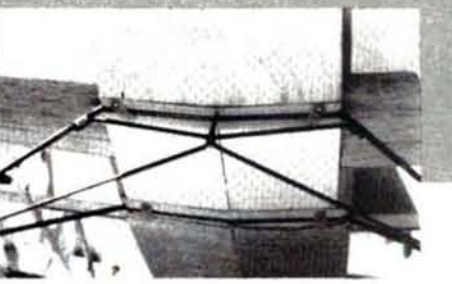
WHAT DO YOU get if you enlarge the Sig Spacewalker three times? A person-carrying version, naturally. Comparing other models to the full-scale plane, it's interesting to note that even the wing loading is one-third that of the full-scale version. Talk about near-perfect design scaling!!

During this year's annual EAA Convention (better known as "Oshkosh"), we managed to get Hazel Sig and Maxey Hester together with their nearly identical full-scale Spacewalkers for a photo session. Although we were unable to get the air-to-air shots we'd planned, the occasion did provide the opportunity to closely examine the full-size machines, which are meticulously detailed and obviously built with lots of TLC. We discovered that Maxey's Spacewalker was built in less than three months! Chris Abate's Field and Bench took longer than that!

I guess this *really* depicts the broad range of scale kit airplane sizes. ■

Wing attachment method is simple and ensures positive alignment. Retention hardware access is through lower wing covering.

The tail group employs traditional built-up design features and closely follows full scale.



"Birdcage" landing-gear arrangement seems complicated, but it's simplified by accurately pre-bent wire.

heads sticking through the cowling, it almost duplicates the appearance of the full-scale airplane. (More on that, later.)

After deciding on an engine, begin construction. The front fuselage mainframes are built right over the plans and then laminated to die-cut lite-ply front fuselage side pieces. They've been cut extra long to accommodate the length of your selected engine. When this has been done, the aft fuselage mainframes are constructed. From this point on, construction is very rapid and straightforward and mimics full-scale construction techniques. The only difference is that you're using spruce and balsa instead of metal tubing.

When both front fuselage mainframes and aft fuselage mainframes have been completed, it's time to join them. Adding the top turtle-deck formers, and sheeting the top front half of the fuselage only, you have a completed fuselage. Aft of the cockpit are stringers over formers.

The next big task is the assembly of the tail surfaces. These components again mimic full-scale construction methods—that's right: stick construction simulating metal tubing. Remember to sand all the edges to a curve, as you're trying to make it look like round tubing, not square tubing!

Now, while you have the aircraft in the bare-bones stage, is the ideal time for hooking up the servos and pushrods. The rudder is controlled by wire cable, the elevator by a fiberglass pushrod, and the engine throttle is flex-cable. The ailerons are driven by a servo in each wing panel.

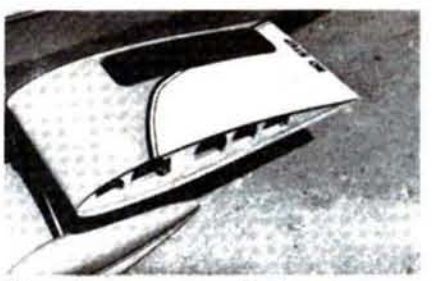
Almost ¼ pound is saved with lightening-hole "knockouts" in wing ribs.

All necessary hardware is included in the kit.

The hardware package looks as though you bought half the hardware store, and what's *in* the package *works*. There was no need to hook anything up differently.

There are five fiberglass molded parts: wheel pants, wing tips and engine cowling. These components were the only part of the kit with which I was disappointed. All the parts had many pinholes that took some time to fill. Also, the score lines for the cooling holes in the cowl were absent. Speaking about the cowl, if you decide to use a twin-cylinder engine, you'll have to cut the cowl in half, ending up with a top and a bottom. Attach the cowl to the fuselage while it's still in one piece and mark a cutting line in line with the thrust line of the fuselage. This should split the spinner backplate in half, as viewed from the front or side profile. The back of the cowl should be attached as shown on the plans. The top and bottom halves can be secured by gluing metal or wooden tabs to the bottom half of the cowl, placing the top half over the tabs and drilling and tapping for the attaching screws. I used 2-56 machine screws with blind nuts, and this worked well.

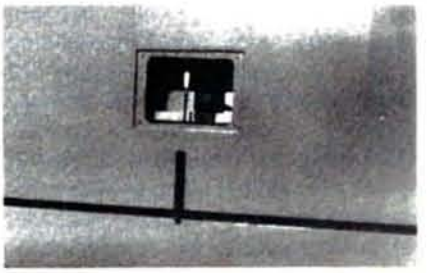
Your Spacewalker can be covered with your choice of covering. I chose Coverite's* Super Coverite iron-on, as I've always found it easy to work with and I like the end result. Covering is fully discussed in the instruction book.



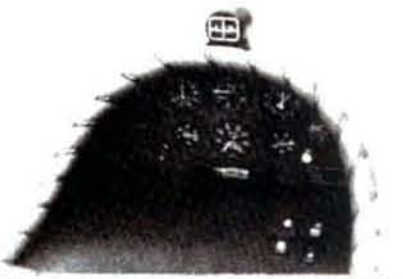
Nice, clean appearance at outer wing-panel attachment point is achieved by using a fairing. Fine sandpaper used to simulate non-skid wing walk.

Cheveron* Perfect Paint was selected for the color scheme, and its performance didn't disappoint me. The cream and light blue perfectly matched what I had in

(Continued on page 96)



In contemporary giant-scale fashion, a single servo is used in each outer wing panel to drive aileron.



J'Tec instruments were used to simulate the panel of a typical full-scale Spacewalker.

On the ground in a rustic setting, or airborne in a cloudless sky, the Spacewalker presents a pretty picture—large and lovely.

Quiet Flight

by JOHN LUPPERGER

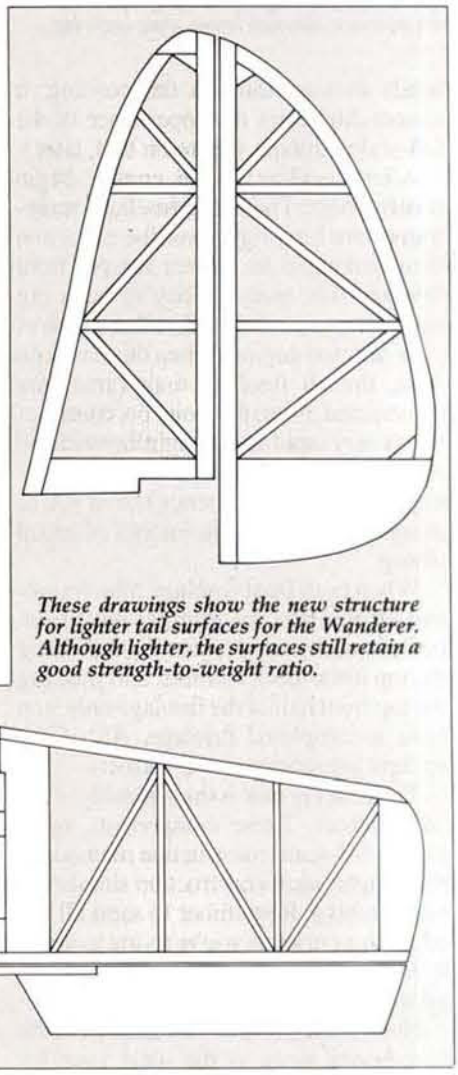
LEARNING IS A never-ending process! We're constantly learning new things about our hobby. We pick up new building techniques, learn about better aerodynamics and become better pilots through practice. We can also continue our education by attending school. I'm enrolling in a couple of college classes this fall: Basic Photography and Computer File Management/DOS. I hope that these two classes will help me put together a better column for you. There are many computer programs dealing with airfoils and aerodynamics, and through a better understanding of my computer, I hope to utilize some of these programs and to pass that information on. I hope the photography class will enable me to present you with sharper, clearer photos.

17th Annual Astro Flight Championships

This year's Astro Champs on June 19 and 20 had 34 competitors flying in four different classes. There were six entries in Unlimited Old-Timer, five entries in Unlimited Sailplane, eight entries in 7-Cell Old-Timer, and 15 entries in 7-Cell Sailplane. For the first time, the Sailplane and Old-Timer events ran for two days. In the past, only two rounds were run on one day of flying. With two days of flying and four rounds, the final results were more indicative of the pilots' abilities.

Also for the first time, the flight tasks included varying motor run and flight times (see my June '88 column) along with spot landings (in/out for the Old-Timers, and measured tapes for the Sailplanes). The pilots seemed to like the format, and with earlier, more effective publicity, next year's event should see quite a few more entries.

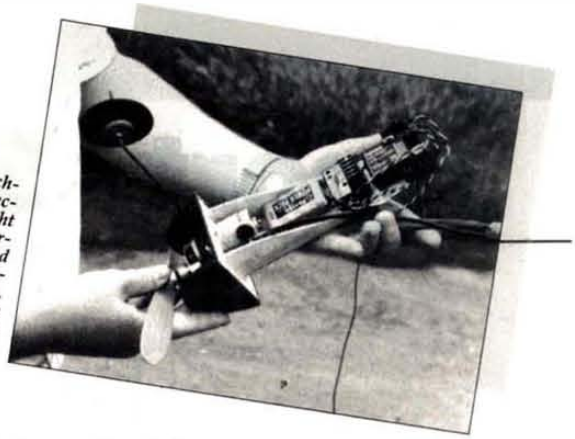
The level of competition was very high. To the best of my knowledge, all the competitors used cobalt motors and it showed in their climb performances. Many used 900mAh Sanyo SCR batteries, and another visible trend is the use of electronic speed controllers. The more powerful FAI wind cobalts tend to weld



These drawings show the new structure for lighter tail surfaces for the Wanderer. Although lighter, the surfaces still retain a good strength-to-weight ratio.

Unlimited Sailplane winners at the 1988 Astro Champs. Left to right: 1st place, Bob Sliff with 3M Electrognome; 2nd place, Jason Perrin with Sniper; 3rd place, Gary Westland with Challenger.

Seven-Cell Sailplane winners at the 1988 Astro Champs. Left to right: 1st place, Bob Sliff with Electrifier; 2nd place, John Lupperger with Amplitude; 3rd place, Howard Doering Jr. with Electricus.



Bill Forrey's scratch-built Strato Streak electric had the motor, flight batteries, radio batteries, receiver and speed controller on a removable fire-wall tongue. Only the servos were permanently mounted in the fuselage.

the contacts of microswitches and on/off relays, and to be competitive at today's electric events, the aforementioned combination seems to be a must.

The results in each class are listed with the photos. Next year's Astro Champs should be a great event, and I'll announce the date here. It will probably be some time in June.

Electric Motor Maintenance

With most of our hobby equipment, we tend to do very little maintenance until something goes wrong. When was the last time you had your working radio tuned up? the last time you stripped a model that flew well to check it for structural damage? the last time you took apart a well-running motor, cleaned it and lubricated the bearings?

Recently, I went to some local R/C car races and talked to some of the drivers about their cars. They *all* spent a lot of time maintaining their motors. After an event, the top racers usually take their motors apart to clean the commutator, armature and bearings.

To find out just what these maintenance procedures are, I contacted the proprietor of Cheetah Racing*, Carlos Turano, an avid racer who knows all the little tricks and also makes and markets a clever little device known as a bearing blaster.

Carlos takes his motor apart and cleans all the major parts with a motor spray such as Dan's Motor Spray. He then checks the commutator, and if there's any build-up in the division lines, he cleans them with a wooden toothpick. The lines are very fine, and you might be tempted to clean them with an X-Acto knife, but *don't*. Never clean them with anything that could scratch the copper of the commutator, as it could be disastrous for the brushes.

Carlos then puts the armature in the can and checks its position. He told me to check whether or not the end-plates leave any slop at the output shaft. The armature will take a natural set in the can, due to the magnetic field. Shim washers are then used to ensure that the armature will stay exactly in the middle of the field for best power output. This seems even more important in our planes, as we must contend with the forward thrust action of the propeller.

With the motor reassembled, the bearing blaster is put to use. This is a plastic capping device that's placed over the end of the motor, completely covering the bearing. A washer on the inside seals it, and the motor spray tube is inserted into a small hole in the side of the blaster. The motor spray is then shot into the blaster and through the bearing, so cleaning out all dirt and contaminated lubricants. This blows material into the motor, which then gets another shot of motor spray. The process is then repeated on the opposite end of the motor. The bearings then get *two* drops of oil on the outside surface, and the motor is hand-turned to draw the oil down into the bearing.

Just before final tuning, put a couple of drops of Revtech* Comm Drops directly onto the commutator surface, spreading them by hand while turning the motor. Comm Drops are a conductive lubricant that allows the motor to turn more easily while also improving the flow of electricity.

The motor is then tuned by advancing or retarding the timing to achieve the correct amperage draw. For electric fliers, this final tuning needs to be done with the flying prop to make sure the motor isn't over-propped, or drawing too many amps.

(Continued on page 95)

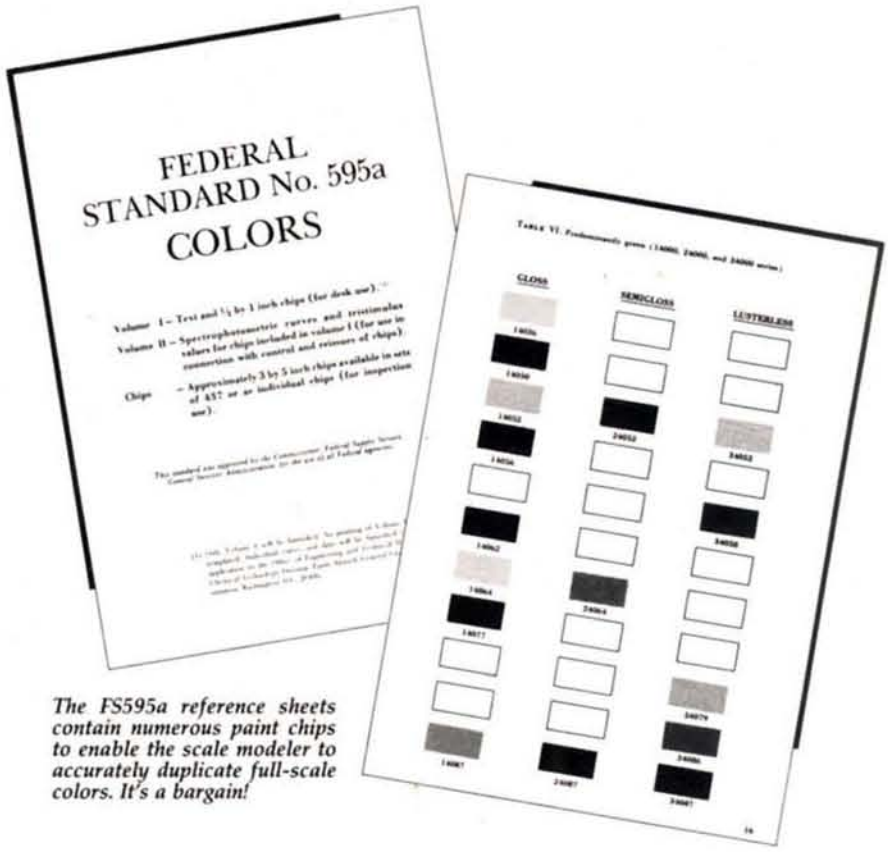
Seven-Cell Old-Timer winners at the 1988 Astro Champs. Left to right: 1st place, Gary Westland with Lanzo Bomber; 2nd place, Lowell Howe with Playboy Cabin; 3rd place, Joe Ballasch with Lanzo Bomber.

Unlimited Old-Timer winners at the 1988 Astro Champs. Left to right: 1st place, Ross Thomas with Lanzo Bomber; 2nd place, Bob Sliff with Playboy Cabin; 3rd place, Gary Westland with Playboy Pylon.

Sporty Scale Techniq

by FRANK TIANO

Color Documentation Mystery Solved



The FS595a reference sheets contain numerous paint chips to enable the scale modeler to accurately duplicate full-scale colors. It's a bargain!

ISN'T IT GREAT that *Model Airplane News*, under the direction of its new big cheese, Steve Stun—um...I mean Rich Uravitch—has decided to bring back the regular "Sporty Scale" column? I think so, and that's the main reason I volunteered to write it.

Frank's scratch-built Kawasaki Hien benefits from accurate color scheme documented by cross-reference to FS595a. Scale Masters competitor.

Rich's goal for this column isn't that it should be flooded with kit reviews; the other pages of this magazine already do an incredible job in that department. He wants some space to show the scale modeler—novice and pro alike—what's new, what's good, what's right and what's happening. To accommodate his wishes, I'll attempt to bring you some "how-to" articles, along with comments on new releases aimed at the scale society. We also plan to cover various scale events taking place throughout the country. We'll discuss *every* area of scale modeling. If you have any questions or ideas on how this column can serve you better, just drop me a line in care of *MAN*.

The Elusive Color Chip

With that out of the way, let's go on to this month's subject: "Where do color chips come from, and how do I get some?" The answer to that question can be a

very simple one, as long as we don't ask why someone wants color chips in the first place. When you select a new scale project, it's very important to *first* pick out the color scheme you like, then find documentation for that scheme, and *then* start building the model. The reason for this is simple: Many times, we find that the color scheme for our model is for a version that's different from the one we've painstakingly built. A marvelous color scheme for a Japanese Zero ain't worth a plugged nickel if you're sitting with proof of color for an A6M3, and the model in front of you is an A6M5. Get the picture? So, assuming that all your ducks are in a row, we can move on to finding some color chips.

There are two ways to document the color of a competition scale model: one is by matching an artist's rendition of the subject; the other is by finding a photo of the aircraft with a caption detailing the color scheme. Sometimes we can find information in books that deal specifically with the color and markings of a certain aircraft throughout its service career. In any event, either of these sources will usually provide a verbal description of the colors. For example, "This P-47 was painted medium green on its top surfaces and light grey underneath. The national insignia had a red surround and there were yellow identification bands on both surfaces of the wing." While this information can give us a great mental picture of just how the ship will look with this scheme, we must still *prove* the colors to a judge if we intend to enter contests. For the serious modeler, finding the proper color chips for paint matching is far better.

Your next question will probably be, "Where do I find them?" The answer to this one isn't quite as black and white as you may think. Color chips can be found in various books and magazines, but these may not always give a true indication of the real color, since shades of color can vary from one printing run to the next. What we really need are paint chips of the "no-foolin" kind. As difficult as this may first sound, it's really a piece of pie. (I don't care for cake). As well as the old Dave Platt* color chips, the Monogram* Painting Guide and the Air Ministry OD Defence Colors, you can be absolutely positive of getting accurate color chips (and lots of them) from everybody's favorite relative—Uncle Sam. That's right; simply call the Wright-Patterson Air Force

(Continued on page 96)

FS 595A COLOR EQUIVALENTS

ITALIAN

COLORI FIAT Pre-1941	
GIALLO MIMETICO	23594
VERDE MIMETICO	34258
MARRONE MIMETICO	30219
GRIGIO MIMETICO	36314
GRIGIO AZZURRO SCURO 3	36373
ARSON SISI	
VERDE MIMETICO	34108
MARRONE MIMETICO	30219
NOCCIOLA CHIARO	30257/ 30266
TAVOLA 'X'	
1 GRIGIO AZZURRO CHIARO	36307
2 VERDE OLIVA	24050
3 GRIGIO AZZURRO SCURO	36076
4 NOCCIOLA CHIARO	30219
5 BIANCO AVORIO	33711
6 BIANCO NEVE	37886
7 GIALLO CROMO	33655/ 33538
8 ROSSO	31302
9 VERDE	34062
10 BRUNO	30045
11 AZZURRO	25053/ 15056
12 NERO	34087
13 ALUMINIO	17178

LUFTWAFFE

01 SILBER	17178
02 GRAU	24226/34159
04 GELB	33538
21 WEISS	37780
22 SCHWARZ	37780
23 ROT	31302
24 DUNKELBLAU	35044
27 GELB	33481
28 WEINROT	30049
41 GERATEGRAU	36081
61 DUNKELBRAUN	30111
62 GRUN	34128
63 HELLGRAU	36400/36559
65 HELLBLAU	35526/25414
66 SCHWARZGRAU	36076
70 SCHWARZGRUN	34052
71 DUNKELGRUN	34079
72 DUNKELSEEGRAU	34092
73 SEEGRUN	34159
74 DUNKELGRAU	36081
75 MITTLEGRAU	26231
76 WEISSBLAU	35414/35622
77 HELLGRAU	36492
78 HIMMELBLAU	35414
79 SANDGELB	30219
80 OLIVEGRUN	34096
81 BRAUNVIOLET	24087
82 DUNKELGRUN	34096
83 HELLGRAU	34138

JAPANESE

BLACK GREEN	34052
DARK GREEN	34058
DARK GREY-GREEN	34092
LIGHT GREY-GREEN	34097
OLIVE GREEN	34098
BLACK GREY	36081
DARK GREY	34148
MEDIUM GREY	34226
PALE GREY	36492
SILVER	17178
MEDIUM BROWN	30111
WHITE (Winter Distemper)	37722
YELLOW ORANGE	32473
ORANGE	22246
INSIGNIA RED	21136
INSIGNIA YELLOW	23655
MEDIUM BLUE	25148
INSIGNIA WHITE	27778
RED-BROWN	10076
INTERNAL COLORS	
DARK GREY-GREEN	34092
OLIVE GREEN	34098
INSIGNIA RED	21136
INSIGNIA YELLOW	23655
MEDIUM BROWN	20111
MEDIUM BLUE	25184
BLACK-GREY	26081
WHITE	27778

Helicopter Challe

by CRAIG HATH

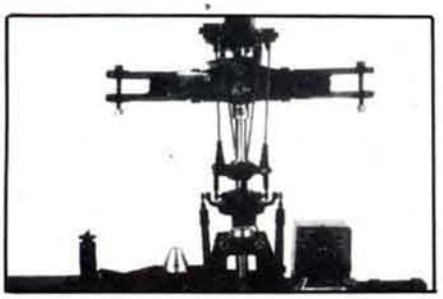
WELCOME BACK to our discussion on trimming for the ideal model helicopter setup. This article deals with fine-tuning cyclic-pitch controls and gives a short review of the steps needed for trimming the total machine from start to finish.

Cyclic-Pitch Control

Cyclic pitch is the control that steers the rotor disc. For those of you who are fixed-wing oriented (airplane) these controls are roughly the equivalent of the ailerons and elevators. On a helicopter, the names of these controls are "fore and aft," or "pitch cyclic," and "roll cyclic." They function in much the same way as the controls of a fixed-wing aircraft, because the object is to change the angle of attack of some flying surface to produce a change in attitude or heading.

Cyclic pitch controls the rotor disc by adding more pitch to the main-rotor blades on one side of the rotor disc and taking pitch away on the other side. This has the effect of tilting the rotor disc, very much like holding your hand out of a car window and moving it around in the wind at speed. Of course, none of us has ever done that, but we all know how it feels, right?

The mechanics of cyclic-pitch control on a model helicopter closely follow those of full-size machines. A servo moves a pushrod, or lever, which moves the swashplate, which moves another pushrod, which can connect to one of three points—*which* one depends on the method being used to steer and stabilize the rotor head. Three popular cyclic-pitch control/stabilization systems are used on model helicopters: Hiller, Bell-Hiller, and Delta three-hinge. Although these systems are usually somewhat modified on a model, the principal system design characteristics are followed, and I'll describe all three systems.



The GMP Stork uses this system to capture the swashplate, avoiding cross-control between pitch and roll cyclic.

FLASH!

1988 AMA National Championships Helicopter Results

ACADEMY OF MODEL AERONAUTICS 1988 NATIONALS JUNIOR-SENIOR OPEN

NOVICE HELICOPTER

Chad O'Leary	Carmel, IN
Yasunobu Maraki	Lawrenceville, GA
Barry Wehrung	Ottsville, PA
Michael Cusanelli	Collinsville, IL
Richard Slutz	Wilmington, DE

INTERMEDIATE HELICOPTER

Wes Suggs	Roswell, GA
Jim Himes	Riverdale, GA
Lance R. Murphy	Hamden, CT
Fred Schneider	Stratford, CT
Terry McCurry	Greenwood, SC

FAI HELICOPTER

Clifford Hiatt	Winter Garden, FL
Ted Schoonard	Orlando, FL
Tim Schoonard	Orlando, FL
Curtis Youngblood	Bryan, TX
Dave Youngblood	Bryan, TX

SCALE HELICOPTER

Don Chapman	Dayton, OH
Michael Robins	Wdbg., VA
Weldon Freeman	Mt. Pleasant, TX
Gary Stonecypher	Eatontown, NJ
George S. Ford	Bloomington, IL

- The Hiller System. Two stabilizer paddles are attached to the rotor head at right angles to the main rotor blades. Cyclic control is the result of changing the angle of attack of the paddles only. This is accomplished by directly connecting the flybar to the swashplate—usually by pushrod. By tilting the paddles (the rotor head is hinged in the center at the hub, or at the blade grips, and linked to the flybar by a seesaw mechanism), the main rotor blades follow the lead of the paddles.
- The Bell-Hiller System. This system uses a series of mixing arms and linkages between the swashplate and the stabilizer bar and paddles. This provides a mix (in varying ratios, according to design) of main rotor blade pitch and stabilizer bar paddles. As the rotor head spins, the paddles will change angle of attack, followed by the rotor blades. The result is a more immediate, positive response to cyclic control.
- The Delta Three-Hinge System. In this system, the flapping hinge that dampens each of the rotor blades is mounted at an angle to the rotor blade. This reduces the angle of attack of the blades as the load increases. In other words, the rotor disc will be more stable in turbulence or in maneuvers that cause unequal lift on the rotor disc. This system is usually used with no stabilizer bar or paddles, and is said to be "flybarless." Note that there's also the need for a cyclic mixing system similar to the Bell-Hiller system, but that the pitch changes affect the rotor blades only.

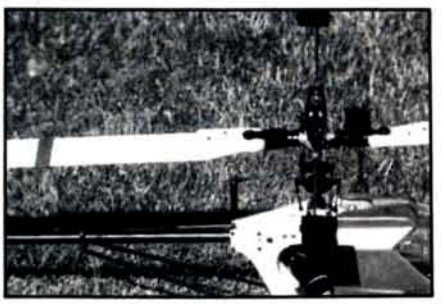
Available for the Cobra, it's called a Super K radius support, and replaces the standard setup shown in the next photo.

This doesn't cover the whole gamut of available systems, but it does represent a good cross-section of what's out there. Correct installation is of importance with all of these systems. Be sure to connect the arms to the proper links, and to match the angles of the arms to the drawings in the kit. If you're in doubt, get help from someone who has experience with your model, or contact the kit manufacturer. The correct setup may seem confusing until you've seen it for the first time. For example, in the extreme case, it's possible to connect the mixer levers in such a way that the cyclic controls operate in reverse! That would make life *really* miserable for any pilot who's attempting to trim a new machine.

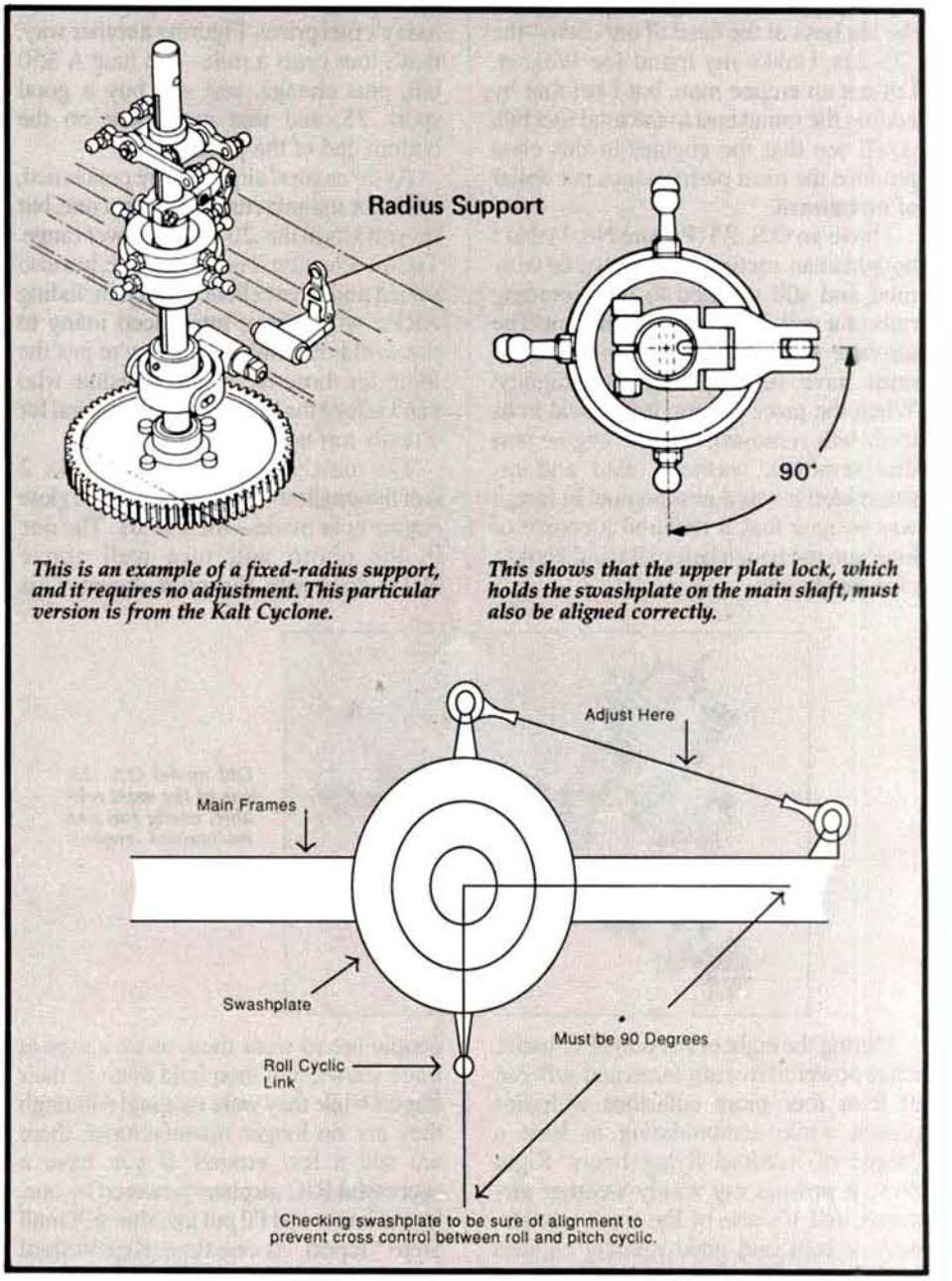
Cross-control between pitch and roll cyclic is another problem that could arise from improper installation. In this situation, a command given for one control will automatically be mixed with the other. Let's say that you push the pitch-cyclic stick forward, intending that the machine move away from you. If cross-controlling exists, the machine will move away *and* to the left or right at the same time. Cross-controlling can make a helicopter very difficult to handle. In the hands of a novice, the condition is hard to detect, because the pilot has little feel for how the helicopter should fly, and assumes that the response is normal.

Cross-control is caused by having the swashplate adjusted in a manner that allows the movement of the linkages to induce control from both axes. For the roll cyclic, the swashplate must intersect the bellcrank at a right angle to the mainframe (see drawing). Any deviation will cause cross-controlling. Some of the kits on the market make it impossible to misalign the swashplate, as they use a

(Continued on page 97)



Here's the standard GMP Cobra radius support. Be sure to get the swashplate lined up correctly.



This is an example of a fixed-radius support, and it requires no adjustment. This particular version is from the Kalt Cyclone.

This shows that the upper plate lock, which holds the swashplate on the main shaft, must also be aligned correctly.

Checking swashplate to be sure of alignment to prevent cross control between roll and pitch cyclic.

Small Steps

by RANDY RANDOLPH

I'VE BEEN doing a lot of talking about the smallest of the "small steps," so I'll now give equal time to the big boys at the head of our class—the .20-.25s. Unlike my friend Joe Wagner, I'm not an engine man, but I bet that by adding the initial cost to the total fuel bill, you'll see that the engines in this class produce the most performance per dollar of investment.

I have an O.S. .25 (Picture No. 1) that I bought at an auction for $4, covered with mud and still screwed to the mounting rails of a very broken engine mount. The airplane that had once been behind it must have suffered a great indignity! When the piece of prop it still held in its teeth was removed, and the engine was disassembled, washed, oiled and reassembled it was a new engine! In fact, it was so new that it required a couple of hours on the bench before it would hold a nice steady idle.

Old model O.S. .25, one of the most reliable, easily run and maintained engines ever made.

During the eight or ten years I've had it, it has powered five airplanes and suffered at least four more collisions with this planet, while accumulating at least a couple of hundred flying hours. Right now, it powers my windy-weather airplane, and it's one of the most reliable, easy-to-start and good-running engines in my mottled assortment of propulsion equipment.

I hope I've shown how economical and easy to maintain the engine is. Every airplane that took it aloft carried a 4-ounce fuel tank that kept it flying for 14 to 18 minutes at average speeds of 40- to 60mph. That works out to about 7.5 hours per gallon of fuel, or $2 per hour at today's fuel prices. Figuring another way, that's four cents a mile—not bad! A $50 bill, plus change, will still buy a good sport .25, and that puts them on the bottom end of the price list.

As far as *good* airplanes are concerned, all major manufacturers offer not one, but several kits in the .20-to .25-power range. The kit selection is not only large, but also varied and of excellent quality, including ARFs, which have introduced many to the world of small steps. They're just the thing for those on a tight schedule who can't afford the building time required for a really top-notch performer.

This must be engine day! Picture No. 2 is of the smallest-volume-production glow engine ever made—the TD .01. The one in the photo will turn well above 20,000rpm with the prop shown. Cox people use to wear them as tie clasps at trade shows, and then hold them in their fingers while they were running! Although they are no longer manufactured, there are still a few around. If you have a successful R/C airplane powered by one, let me know and I'll put together a "Small Steps" report. At one time, Ken Willard had one powering a little R/C biplane, and it seemed to work well.

Picture No. 3 is of a test stand for .049 engines that I wrote of some time ago. It works for the Bee types as well as TD engines and, since the Tatone* folks are back with their long ½A mount it will work with the G-Mark .061 as well. The shelf under the engine is used to hold a tank when an engine is mounted on the other side. Clamp the whole works in a vise to run the engines.

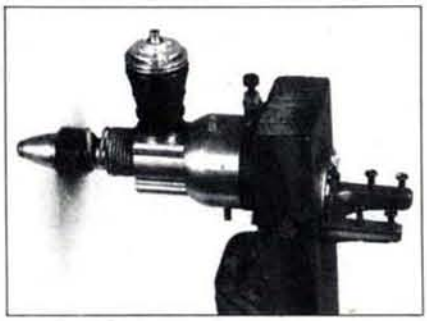
A Golden Bee and its friend, the tie-clip TD .01.

News from Canada

Here's some information from Jack Moisley in Canada:

Jack writes, "...My favorite is my Baby Buzzard Bombshell (silk and dope covering) from RCM plans (around 1976, I believe). I built the straight-wing version, which is better in thermals and crosswind landings. It has a span of 48 inches, a chord of 9 inches, and this version uses a reworked sailplane wing section. It has been around since June of '82 and has worn out one .15 engine and gone through two piston and sleeve sets in two others. It's a fantastic machine; I've soared it for up to an hour in thermals and almost lost it in a couple of boomers. The penetration is very good in the wind, and I even got it down in a perfect landing when caught in a sudden rain and wind storm.

"If the air is blah, I can hot-dog it, fly upside-down and around the field, do loops and a pattern-type outside loop, too—no problem! It's a 3-channel airplane; ailerons would be a waste. The tank is custom-made, because there isn't much room, and it only holds about an ounce and a half of fuel. On this, I can get



A multi-engine test stand. (See text.)

at least a 20-minute flight when the air is poor…"

The Buzzard Bombshell was a free-flight design that won the Nationals back before World War II. The original was a 6-foot airplane powered by a Brown Jr. engine. Jack's modernized R/C version sounds great; wish he'd sent a picture. Always pleased to hear from readers.

Finally, in the "G-Man" article (April '88 issue) I failed to mention that the G-Mark .061 (as well as a companion .03) is available from Cannon Electronics, Inc.* The cost of the .061 is $41.95, plus shipping charges. They should be available at most good hobby shops; at least they are here in my home town.

Till next time…

**Here are the addresses of the companies mentioned in this article:*

Tatone, 21658 Cloud Way, Hayward, CA 94545.

Cannon Electronics, Inc., 2828 Cochran St., Suite 281, Simi Valley, CA 93065. ■

About Those Engin

by JOE WAGNER

THERE ARE SOME excellent miniature diesel engines on the market, and they make marvelous power plants for R/C models. They're powerful, quiet, and the coolest-running model motors. Their fuel economy is amazing, and they can spin almost any size of propeller you can fit onto their crankshafts: A 9-3 will run nicely on an .06 diesel, while racing .15s can turn 7-6 props at over 20,000rpm.

Actually, there's no such thing as a true diesel engine in model form. The diesel principle involves the piston compressing air alone in the cylinder. When the heat produced by this compression reaches a peak, a high-pressure pump injects a precise amount of fuel directly into the combustion chamber. This ignites in the superheated compressed air and produces the power stroke.

Genuine diesel engines work on the four-cycle principle. All model "diesel" motors are the two-cycle type, and should really be called "compression-ignition engines." They operate like glow motors, but instead of a glow plug providing the heat to ignite the fuel-air mixture in the cylinder, high compression alone does the job.

Real diesel engines thrive on hard-to-burn fuels. Kerosene is the most commonly used of these, but diesels have often been run on crude oil, coconut oil, and even melted lard. Model diesels must use very easily-ignited fuel, because they don't build up enough heat to burn anything else. It's true that model diesel fuel is about one-third kerosene. However, the active ingredient that initiates combustion in a model diesel motor is ethyl ether, which is the same agent that's used as a surgical anesthetic.

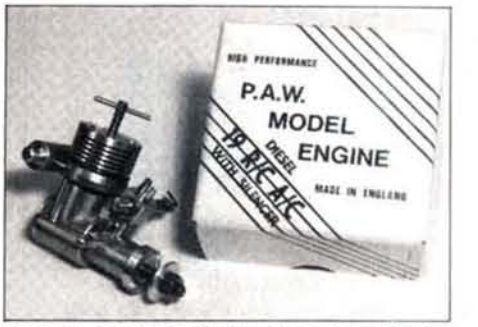
The way ether works in an engine fuel is unusual. When ether vapor comes in contact with heated air, an almost instantaneous chemical reaction occurs that forms peroxide compounds much like those used in missile fuels. These peroxides begin burning very easily, and cause the kerosene to ignite in model diesel fuel. Because of this action, which is entirely different from the almost detonative combustion process of glow fuel, the sound made by a model diesel engine is softer and less annoying than that of a glow motor, even though the power being produced is essentially the same.

For quite a few years, Bob Davis (of Davis Diesel Development*) has been marketing diesel conversion kits for many different model engines, from Cox .020s to the big Enyas, Super Tigres and Foxes. Although they work very well, they haven't been used too much by model fliers. The conversion kits are expensive and are comparable in cost to that of the engines they fit. Also, until recently, fuel for model diesels has been quite hard to find. Mixing your own fuel isn't difficult, but it's hard to find a source of ether.

P.A.W. .29 or .35 (they're externally the same) in Eric Clutton's Old-Time R/C scientific "Red Zephyr,"—a 1937 design.

Now for the good news: F.H.S. Supply, Inc.*, maker of Red Max model fuels, is now selling excellent-quality diesel fuel at a reasonable price. F.H.S. will also mix fuel (glow or diesel) to your personal specifications, at the same price as its standard blends and in quantities as small as a single gallon.

F.H.S. uses metal cans for packaging diesel fuel, because it deteriorates in the plastic jugs used for most glow fuel. However, you can use a polyethylene squeeze bottle as a fueling container for model diesels. The same kind of plastic "clunk" tank used for a glow engine can be installed in a diesel-powered model, provided the model's tank is emptied after each flying session. (You should do the same with glow fuel, of course.) The only difference is that neoprene or Buna-N fuel tubing should be used for model diesels, both inside and outside the tank, as well as in the squeeze bottle.



Note the P.A.W. .19 R/C's minuscule muffler! Nothing larger is needed, and it's no problem installing a motor like this in a scale model.

Petroleum-type fuel ingredients, such as gasoline and kerosene, make both silicone and non-synthetic rubber swell and deteriorate. Neoprene and Buna-N, however, are almost impervious to all hydrocarbons. Before silicone came along, neoprene was the universal material for model fuel tubing. Although hard to find now, Sullivan Products* (the fuel-tank makers) can supply Buna-N fuel line in both 3/32-inch and 1/8-inch sizes. (Don't use vinyl tubing at all for model fuel lines: *All model fuel causes vinyl tubing to lose flexibility.)*

Just about all of today's model diesel motors are made in Europe. They originated in Switzerland in 1938 and have been popular throughout Europe ever since. A few American diesels have been made: The Drone .29 and Mite .099 of 40

A pair of .06-size European model diesels of 30 years ago: an E. D. "Bee" from England (at left) and a West German Taifun "Hobby."

years ago were popular for a short time, mainly because the glow plug hadn't yet come into use. Later, both OK and McCoy manufactured diesel versions of their smaller glow motors. For the most part, no American-built model diesel ever achieved wide use. But English diesels were a success. For example, the small Mills engines, first made in the 1940s, were so popular worldwide that many replicas were recently manufactured in England, Australia, and India. They also sold well in this country.

A gallon of F.H.S. Supply's new diesel fuel with one of the squeeze-bottle "fuel pumps" Sig used to sell. Note the neoprene tubing inside.

For use in today's R/C models, the best British diesels I know of are the Progress Aero Works* (P.A.W.) engines, now available in the USA from Eric Clutton. Eric was well-known for a long time as a top-ranking aeromodeller in Britain. He moved to the USA a few years ago and we now have his expertise available to us on this side of the pond.

The P.A.W. line of R/C model diesels includes an .049, an .06, an .09, a .15, .19, .29, and .35. All are similarly constructed: very robust inside and out, and obviously made with extreme care. They are production engines, of course, yet they're built on an almost custom basis. I'm impressed by details such as the point of the steel needle wire being hardened—but *only* the point. (In a crash, the exterior part of the needle may get bent and it can usually be straightened again.)

The P.A.W. engines come with mufflers already attached. These are tiny in comparison with glow-engine mufflers: The P.A.W. .19 R/C's muffler is only a quarter of the size of the K&B .20 R/C Sportster, but this is all the P.A.W. needs because of the inherent quietness of model diesels. Their very small mufflers make the P.A.W. motors ideal for scale R/C airplanes, as they're so easy to cowl-in.

As well as the tiny mufflers, there are other advantages to using P.A.W. engines. Diesels run cool and seldom overheat when enclosed in a scale cowling. Because model diesels use far less fuel per minute of running time than glow motors, you can get by with a tank of half the usual capacity. This can help a lot in 1/2A scale models! Diesels don't need provisions for connecting electricity to a glow plug, thus simplifying cowled-in installations. It's true that the compression screw in a diesel's head requires adjustment when starting. However, Eric can supply a socket-head screw for a couple of bucks, and this replaces the stock "tommy-bar" screw of each P.A.W. motor. With the socket-head screw, all you need is a small hole in your scale cowl for an Allen wrench to adjust the engine's compression.

Variable compression is what makes model diesels so versatile, because it permits "tuning" the precise point in the stroke at which firing occurs. It works like the adjustable "points" of a spark-ignition engine. And, like spark-ignition motors, model diesels use the same blend of fuel, regardless of weather conditions.

Learning to use the compression adjustment is simple. Choke the engine a turn or two and flip the prop smartly, while gradually screwing-in on the compression until the engine fires. Once it's running, back off the compression screw a smidgen, because, as the engine warms up, less compression is needed to ignite the fuel-air mixture.

As with any model engine, a model diesel's needle valve also requires adjustment. The diesel's different sound may be confusing at first when you're trying to arrive at the optimum needle setting. Just remember: A smoky exhaust and a tendency to rev up and down indicate a too-high mixture. Misfiring and a gradual slowing are evidence of excessive leanness.

Besides the P.A.W. line of model diesels, Eric Clutton also carries the recently-revived line of Davies-Charlton motors. The old D-C company is under new ownership now and bears the name of "Quickstart". Available models are the Dart .03, Merlin .049, Spitfire .06, and Sabre .09. All come complete with fuel tanks and spring starters.

**Here are the addresses of the companies mentioned in this article:*

Davis Diesel Development, P.O. Box 141, Milford, CT 06460.

F.H.S. Supply, Inc., P.O. Box 9, Clover, SC 29710.

Sullivan Products, 1 North Haven St., Baltimore, MD 21224.

Progress Aero Works; distributed by Eric Clutton, 913 Cedar Ln., Tullahoma, TN 37388. ■

Building Model Airplanes

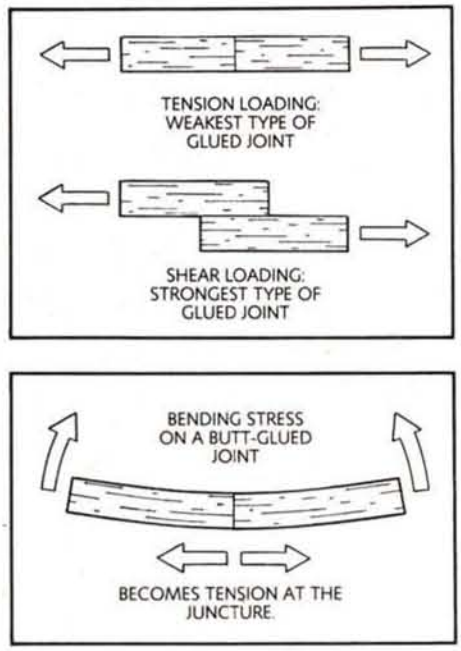
by JOE WAGNER

IN SOME WAYS, model-airplane building is rather forgiving: An R/C model can be sloppily covered, it can have square-cornered tail surfaces and misaligned wings, and it will still fly. But, for the sake of safety if for nothing else, there's one area that has to be right. I'm referring to adhesives—the materials that join miscellaneous bits of balsa, plywood, and plastic to form a finished airplane model.

There are many types of cements and glues for model-building, but only a few are truly suitable for the kind of stresses an R/C model airplane routinely suffers. First, I'll briefly discuss the stresses that glue joints must withstand.

No matter what type they are, adhesives never fail because of *compression*. That's why brick walls can be assembled with brittle-as-chalk mortar, and still last for hundreds of years. But glue joints do come apart when overstressed by *tension* (the kind of strain exerted when a pair of magnets is separated with a straight pull), or in *shear* (as demonstrated by sliding magnets apart sideways). Glued joints are *much* stronger in shear than in tension. That explains why a wing rib cemented into a notched trailing edge is less likely to come loose than one that's merely butt-joined. Whenever practical, use lap-type glue joints instead of butted ones.

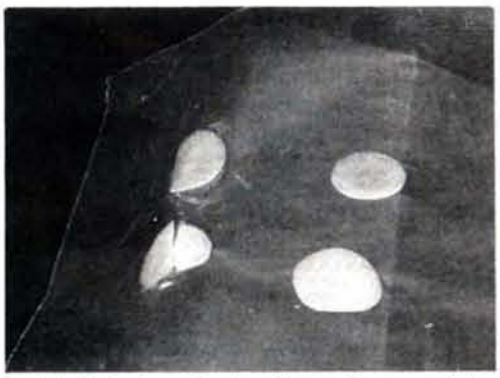
Of course, some joints have to be butted, e.g., the dihedral breaks in hand-launch glider wings, or the bulkhead-to-fuselage joints in R/C models. In order to safely contend with the butt-type joints, the best-available glues must be used, and these are: epoxies, cyanoacrylates (CA), polyvinyls (white glue) and old-fashioned model-airplane cement.



• *Epoxies* are fuelproof, extremely strong, and cure without shrinking. Although there are many brands, it's best to use those made specifically for model building. HobbyPoxy* is a good one; Sig's* Kwik-Set is another. (The brands you see in blister packs at the supermarket probably contain cheap fillers and extenders that weaken or embrittle the cured glue.)

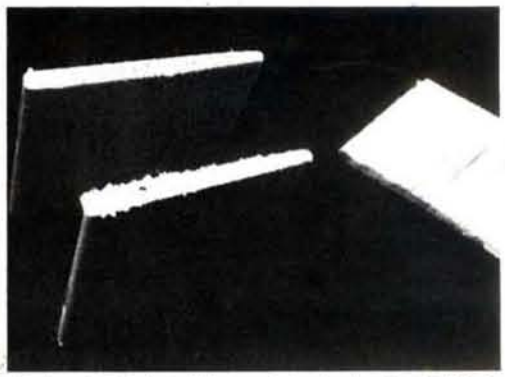
The drawbacks of epoxy are few, and aren't hard to overcome. First, it's heavy, but you don't need to use too much, as it's the glue *within* the joint that does the work. (External fillets of epoxy add little strength and much weight.) Second, it's much harder than balsa, or even lite-ply, and if you accidentally smear some on an outer surface of your model, it's mighty difficult to get rid of after it has cured.

(Continued on page 98)

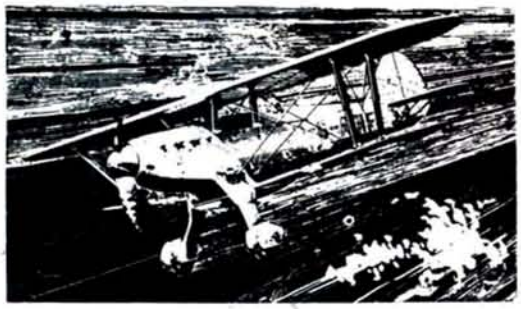


Dried aliphatic resin glue (in the foreground) is extemely brittle, while Sig's "Super Weld" white glue (in the background) retains flexibility.

Large bottles of CA can split and leak, as these two have done. Smaller containers don't seem to suffer from this problem.



Broken butt joints. The one in back, glued with thick CA, failed at a much lower load than the one in front, which was glued with the thin type. Note the difference in the amount of wood fibers adhering to the broken ends.



Golden Age of

by HAL "PAPPY" DeBOLT

DURING RECENT COLUMNS, I've been sidetracked from R/C history by other items that seemed to have priority. I also moved too far ahead by discussing Bonner's digital system when *analog* was actually the first commercial proportional system. While analog systems had a very short lifespan, the period showed us what the future had to offer and spurred on the development of the digital system we use today.

Historically, analogs are the most important. To my knowledge, there were only four commercial analog systems, and the most popular were Space Control and Orbit, followed by Sampey and Citizen-Ship. Sampey became famous when Maynard Hill used it to set an R/C altitude world record. The Citizen-Ship system wasn't full-house, so it didn't attract accomplished pilots. For the details, I'll use the Space Control, which has an interesting history and was widely used.

The fabulous Space Control proportional system. The infamous "red brick" was bolted into the model; contained all airborne components except the separate aileron servo. That's a spare "disc cell" Ni-Cd pack; the receiver battery is in the metal box. One cable is for the aileron servo, the other two were plugged together to turn it on—no switch! Note that the single-stick transmitter had the first separate trim controls for aileron and elevator.

Space Control

The space program gave birth to corporations that made giant strides in electronics. As long as the space program flourished, engineers frenetically explored new electronic setups, and the results speak for themselves: Satellites are now common, and Neil Armstrong explored the moon! Could R/C use a little of their expertise?

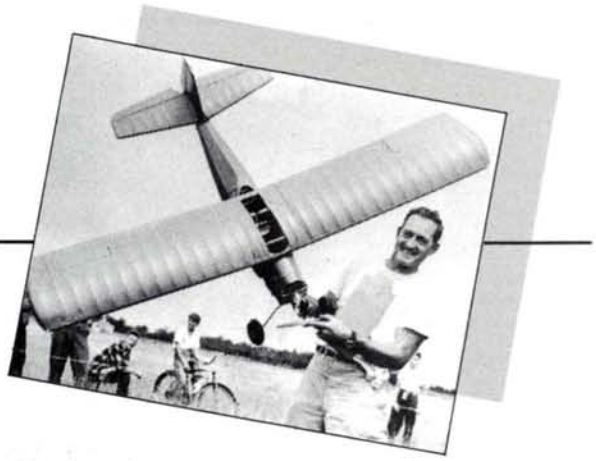
By the early '60s, when the space program was drastically curtailed, some of the "space corporations" were very large. Geared to the space industry, they lacked other product lines to sustain them, and without space contracts, they either had to find other endeavors or close their doors.

One of these large corporations went looking for new products and somehow determined that the hobby industry might offer a new future. Others thought the same, and several established R/C manufacturers were taken over, including Cox, Orbit, Kraft, etc. Industries were advised to expand into all areas dealing with leisure-time activities, and this obviously included hobbies.

Our "story corporation" executives investigated the R/C industry and saw a "green light." You may know that large corporations use established programs in which the first step is the evaluation of the state of the art, the second step is to determine what's available, and the third step is to decide what's needed. Seeing the green light meant that they felt the potential market was there and they could fill the need.

With the need determined, ideas were conceived to meet it. It was decided that R/C hobby power should come from Ni-Cd batteries (dry cells were still the usual source) for voltage stability and lower operating cost. The transmitter should be hand-held and its controls should reflect full-scale practices. This led to the development of a single control stick with *trim* on the primary functions. The transmitter came to be cradled on the left forearm, with the engine and trim controls operated by the left fingers. For rudder control, the single stick had a knob on its end that rotated like a steering wheel. As with today's Mode II, right and left stick controlled ailerons, and up and down controlled elevator. Most important, the degree of movement of *all* transmitter controls had to be precisely reflected by control-surface movement—the system had to be *truly proportional!*

The idea demanded that the airborne system should be *one* self-contained unit that could be *bolted* into the airframe and easily interchangeable between models. Thus, no electronic ability would be needed for installation and it would be (they hoped!) idiot-proof! So originated the quickly named "red brick." This nickname came from the red anodized aluminum box into which the battery, receiver and servos were mounted. Following space-program practice, the receiver was *encapsulated*, in the hope that



Jim Walker proudly displays his latest R/C at the 1948 Plymouth Internationals in Detroit. Jim flew impressive demonstrations at this C/L meet.

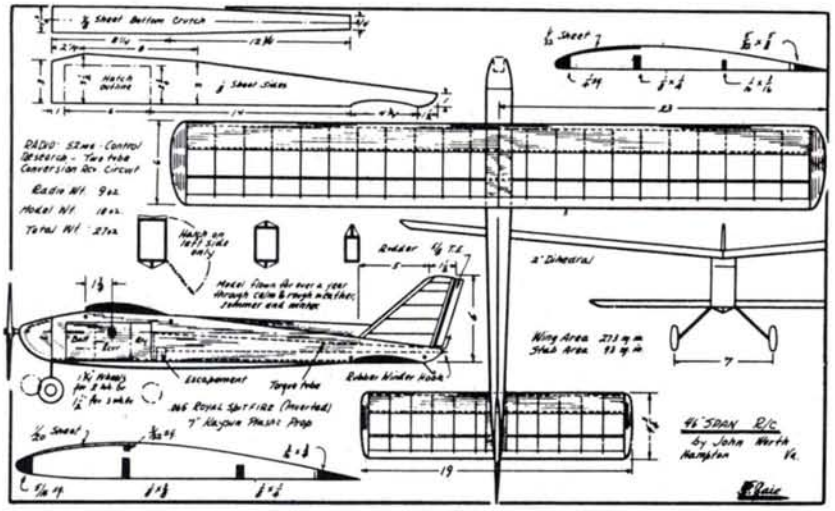
it would be immune to the effects of vibration.

The brick wasn't shock-mounted, and the servos weren't immune to vibration, so they were mounted in the brick with the usual rubber-grommet isolation.

With the idea fully developed, the next step was to determine a method to realize it, both electronically and mechanically. My info is that Herschel Thoomin was the engineer in charge of the project, and that several of the pioneer R/C technicians, such as Don Mathes and Jerry Pullen, may have assisted him briefly. The first priority was obviously to determine how to provide the desired proportional action. Remember, this was to be the *first* exotic system; there was nothing to evaluate or copy. Space Control would have to come from scratch!

The first item would be the servos, and they did have some help with these. Pioneers like Doug Spreng had conceived the feedback principle and its simplicity made it logical. The "Micro-Mo" motor had also proven its worth, so combining the Micro-Mo with feedback promised a convenient solution to a paramount need.

The original Space Control advertisement; you had to buy the batteries separately! The other items came from Zel Ritchie's company.



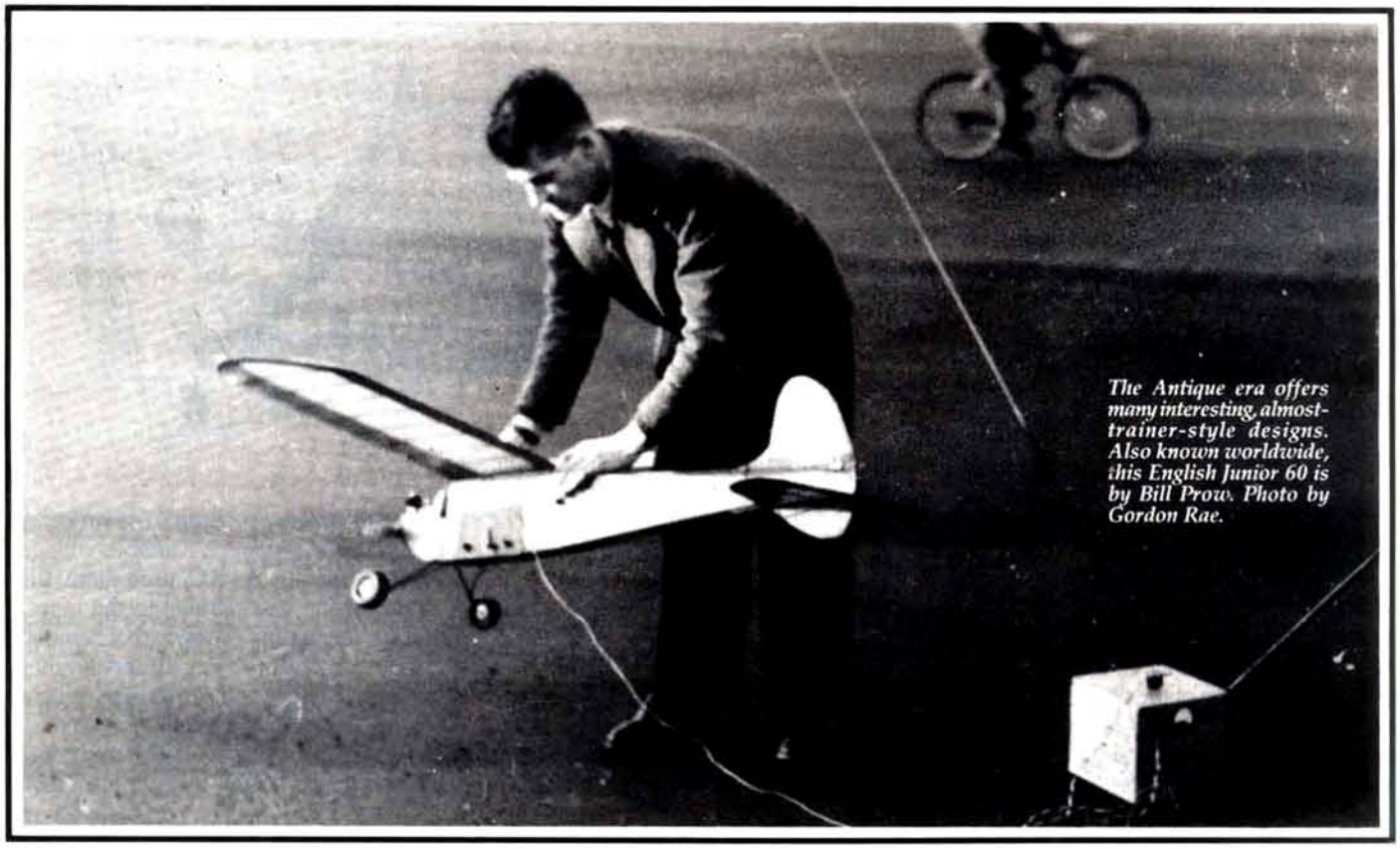
Ever wonder where our AMA leaders came from? You might think this '50s design could be one of today's kits. Note the Eppler-looking airfoil. The creator? Our own AMA Director, John Worth!

Feedback servos—even those we know today—only require a variable-voltage input to operate. As S.C. used them, the output action was parallel to the input-voltage fluctuation. Thus, with a demand for a small control action, the servo motor saw only a minor voltage change. With a heavy air load, the voltage potential (power) might not be enough to overcome the resistance. It took a full transmitter-stick deflection for the servo motor to receive the full voltage. Happily, this didn't matter, as you flew the airplane and *not* the radio. You simply moved the stick as far as it took to make the plane react as you wanted. In practice, as with fast pattern planes, this was actually an asset. The stick was said to be "soft" around neutral—quite like the exponential feature so lauded today!

With the servo design established, the next step was to produce circuitry that would provide variable voltage to the servos. I hope you're getting the message: The development of our first R/C systems was a major undertaking. The first examples required extensive efforts and the application of *new* as well as exciting knowledge of electronics. The efforts made *then* make today's improvements relatively simple to achieve.

How did the Space Control concept provide the necessary variable voltage input to the servos? They decided to use a mixture coding, and to feed this through appropriate discriminators, then to voltage amplifiers and on to the servos. Analog coding is a method of sending precise audio tones over a common RF carrier, such as 27MHz, or 54MHz, as used by Space Control. Each audio tone has a frequency of its own, and several can be transmitted sequentially as long as the frequencies differ enough. Space Control chose 1800cps and 3700cps as basic audio tones. These operated the fundamental controls: the elevator and the

(Continued on page 99)



The Antique era offers many interesting, almost-trainer-style designs. Also known worldwide, this English Junior 60 is by Bill Prow. Photo by Gordon Rae.

FORMATION OF VINTAGE R/C ORGANIZATION

RETURN WITH US NOW TO THOSE THRILLING DAYS OF YESTERYEAR...HI HO NOSTALGIA!!

by HAL DEBOLT and JOE BESHAR

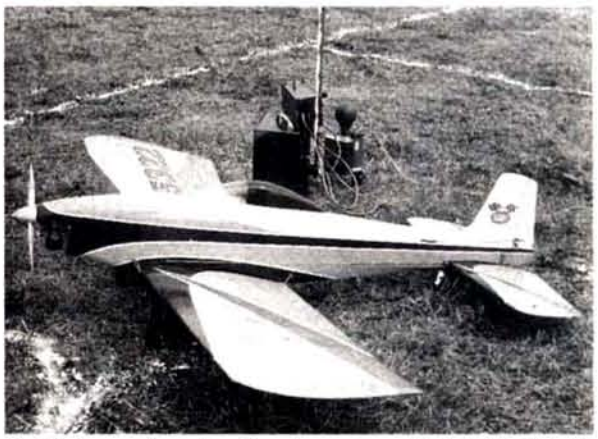
THE ANNOUNCEMENT BY JOE BESHAR will be welcomed by everyone who has shown an interest in *MAN's* "Golden Age of R/C" series. The AMA has expressed interest in an organization that would bring together R/C-oriented members and the pioneers of modeling. Joe proposed a "Vintage Gas Event" and it was accepted by the AMA. Based on free-flight ignition with R/C assist, it was published in the 1988-89 rule book as No. 701 and run for the first time this year at the AMA Nats in Chesapeake, VA. Following this achievement, Joe says, "Now let's get on with OT R/C!"

Many OTers now enjoy building and flying early R/C designs. When these are demonstrated, "modern" R/Cers show an avid interest in them, and their fine performances often entice them to want one themselves. An official organization could provide the leadership and help that newcomers may need to enjoy this "other way" of R/C modeling.

In responses to the "Golden Age of R/C," several desires are apparent. For one thing, current OT R/C activists seem to be geographically widespread, and they express a need to communicate and compare their projects—a need for a connecting link. Additionally, they need established activities (fun-fly-type?) where the capabilities of OT R/C models can be demonstrated. Some like simple, low-key competition—perhaps like the English "Vintage R/C" activities.

As well as this, we have a continuing need for a source of OT R/C plans, kits and even equipment. An organization could centralize such info by, for example, listing sources.

Enough reasons for having a Vintage R/C Society? Enough



The Vintage era has attractions for everyone! This is Hal deBolt's little-known Crusader (note Bramco reed system)—his first multi low-wing. Photo by Ken Taylor of Detroit (now of Phoenix).

initial reasons for *you to act?* I expressed my views in an OT R/C story in the April '88 issue of *MAN*. If you're interested, review that material, although my suggestions were only briefly expressed.

The AMA encourages the formation of an OT R/C organization, as it would benefit not only the OT R/C movement but also *all* modelers.

The Intermediate or Early Bird era saw the offering of the first R/C kits. This widely known Live Wire Champion is an A.G. Lennon production from the early '50s—and it's still flying!

I should also say that the idea for an OT R/C organization was engendered by Bill Winter. Our "dean" of modeling has had this long-standing dream that's developed as a result of your response to his extensive writings. Bill has a habit of foreseeing what we want and need! Joe Beshar comes into the picture with his considerable experience as president of the Society of Antique Modelers (SAM). He's now willing to act as moderator in the formation of a Vintage R/C society. If you write to Joe, you'll receive organizational information, and a VR/CS charter membership could result.

You're interested? Drop Joe Beshar a note with your thoughts—just a postcard will do!

ARE YOU INTERESTED IN PARTICIPATING IN AN OLD TIME R/C MOVEMENT?

MUCH is being written about the Golden Age of R/C. Many have expressed interest in starting an organization specifically for encouraging remembrance of the period, and to promote knowledge of old-time R/C.

The details have yet to be developed, and we look for your ideas and thoughts in this regard—thoughts about a newsletter, other publications, plans, sport and fun events, etc.

The eras are Early Antique (planes before December 31, 1950); Early Bird (January 1951 to December 31, 1955; CB radios came in 1952) and Vintage (January 1956 to December 31, 1965. The first Championship was held in 1960.)

If you're interested, and would like to be kept informed about this movement, please write to me at 198 Merritt Dr., Oradell, NJ 07649. I'm waiting to hear from you; I *know* you have ideas to share. The need for an OT R/C organization exists, and we're counting on your usual enthusiastic support. Let's hear from you! ■

Basics of Radio Control

by RANDY RANDOLPH

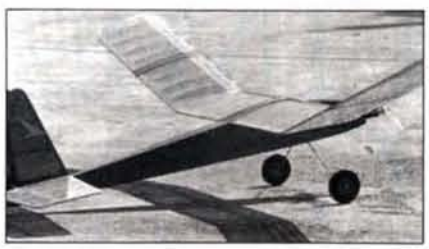
THERE'S NO DOUBT that it's possible to learn to fly R/C without the help of an instructor. If you're familiar with the operation of aircraft controls and how they effect the flight path of the airplane, and if you have a solid, stable trainer like the Twiliter (*MAN* March '87), it *can* be done. However, it's much better to enlist the aid of a good instructor.

Most of us old-timers learned to fly R/C by the crash-and-burn method. Fortunately, the airplanes of that time were free-flight machines that would take care of themselves without any help from us. At that time, we never thought of offering help when a new flier appeared at the field—that would have been an insult. It was assumed that any new flier could learn just like the rest of us! Besides, there wasn't much help we *could* offer. Thankfully, times have changed.

Radios have changed too, and so has the performance of engines and airplanes. Radio equipment today can put a flier in the cockpit of an airplane that, in scale terms, has many of the characteristics of the most advanced fighter. Even so-called "trainers" have a performance level that far exceeds the best combat airplanes of World War II. Who'd fly full-scale airplanes like that without lots of instruction and preliminary flight time! With this in mind, it's obvious that flight training should begin *before* the student invests in radio, airplane or engine.

All of this has been written often in almost every modeling publication. However, there are still innocent victims who appear at flying fields with a new Super-Slipper 90 and a brand-new radio (usually on the only unusable frequency at the field) looking for help with the first flight! Naturally, someone always helps, but is it the *right* someone?

The PT series of trainers from Great Planes offers both small and medium-size aircraft to fit into a variety of training plans. Follow your instructor's advice!



The Twiliter II (MAN December '87) with "training wheels" has been described as the best training machine ever. Students have actually managed a solo and become comfortable in less than an hour of training.

The first flier encountered at the flying field may be just the right person to answer every question and may become a good friend, but the chances of this happening are slim. The result of a first flight without proper instruction could be the total destruction of plane and radio, and a large financial (as well as emotional) loss. It's better for the individual to find out something about the sport *before* he becomes completely involved.

To help newcomers, every R/C club should be certain that the essential information (its name, time and place of meeting, and any information about training) is prominently displayed at the field and in every hobby shop in its area, as well as all local craft, discount, and hardware stores that sell model supplies.

As a new modeler, it's up to *you* to ask questions about instruction, and your dealer should know where there's a club that offers this service. If the dealer doesn't know, try to find someone who does! When you do find a club, talk to the officers; they're usually the ones with the most experience, and they can probably recommend an instructor. Clubs will often require membership in order to qualify for training—a small investment that pays large dividends!

Once a satisfactory instructor has been assigned to you, follow his or her advice when buying your equipment. Different instructors have different training methods and they like their students to use equipment that suits their particular style of instruction. Good instructors take pride in their ability and want their students to make rapid and solid progress. Always keep appointments with your instructor and, if this is impossible, inform him or her well in advance of any change in plans.

Clubs shouldn't mollycoddle new modelers; it's important for beginners to have initiative and to stand on their own two feet. But there's no reason to hide from them, either! That's basic!

Editor's note: *Next month's "trainer" issue will provide additional sound advice!* ■

AIRWAVES

(Continued from page 10)

$300 for spare parts). Anything less just will not do. Do I sound like a puristo-snob? I don't think so. Sure, a smaller, non-collective helicopter will fly, but go to a larger 60-size helicopter and now you have a helicopter that's stable. Novices need a stable helicopter. If someone can blow money on an R/C helicopter, they can also come up with a few more bucks for a 60-size machine.

You failed to say that smaller and simpler *is* the expensive way to go. A novice with a smaller machine will crash more than a novice with a larger machine, so more money is spent on parts, also more time is spent on repairs. Perfect case of false economy.

I've given many hours of my free time to help out novices. I've seen novices with larger machines hovering in less than a month (and good enough to have photographs taken) and novices with smaller machines give up.

Rich, I respect you for your airplane building and flying ability, but when it comes to helicopters, you shouldn't pass judgment on experienced fliers or machines.

Marc Abrams
Elmont, NY

Marc, thanks for the letter. Your first sentence brings to mind the old axiom, "If the shoe fits, etc." Your second sentence supports my position. Too many modelers have successfully become good helicopter fliers for less than that kind of money. I still contend that that's a bunch of bucks to ask a person to lay out for his first attempt at it. I prefer to think of any specialized area of the hobby as consisting of good, better and best approaches. Let's draw a parallel: Someone wants to get into ducted-fan airplanes and has never flown anything; just like a lot of new fliers interested in heli. Take a top-of-the-line, high-performance airplane like the Violett Viper. It can be argued that it, too, is more stable than the smaller, less sophisticated jet, but I don't think the modeler would buy it as his first jet, nor do I believe I would recommend *it as a first jet.*

Your logic "if someone can blow money on an R/C helicopter, they can also come up with a few more bucks for a 60-size machine" totally escapes me. How can you be so presumptuous? "A novice with a smaller machine will crash more than a novice with the larger machine" might be expanded to a novice flying a full-scale machine might not crash at all.

C'mon, there are lots of ways of getting the job done. Let's be a little more open-minded. RAU

We welcome your comments, opinions, and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 251 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and length.

MISTRAL

(Continued from page 17)

only unusual feature is the special control horn that's made of 3/32-inch ply and glued into the elevator. The plans show that the horizontal stab is bolted to the vertical stab with a nylon bolt. This was used on the original to make it transportable by plane in a small box. Unless you also plan to take the Mistral with you when you travel, I recommend gluing the horizontal and vertical stabs together after covering. Just remember to remove the covering material from the glue area to ensure a good bond. Vertical stabilizer construction is also pretty straightforward; just remember to glue on the two pieces of carbon fiber *before* you attach the sheeting. You should install the elevator control cable before attaching the last side-sheeting pieces. The cable needs to exit the top of the vertical stab as far forward in the cable slot as possible. Installing the end fitting and clevis is also easiest at this time. Be sure to trim the cable housing short enough to allow the clevis pin to stop within 1/8 inch of the top of the vertical stab, and don't forget the triangle stock between the vertical and horizontal stabs.

• Fuselage: Attach the doublers to the left and right sides. (Be sure to make a left and a right!) Attach the triangular stock, and then assemble F1 by cutting out the motor-tube material, rolling it around the motor as a guide and gluing along the edges. Use wax paper between the two, so that the motor doesn't become a permanent part of the assembly. Remove the motor and insert the tube into F1, and glue in the 3 degrees of downthrust. Attach F1, F2 and F3 to the left side, then attach the right fuselage side to this assembly. Insert F4 and the vertical stab, and glue them into place while keeping the tail straight. This step is best done over the plans to make sure the tail doesn't look like a banana. Install F5, then attach the filler block between F5 and the vertical stab. Install bottom sheeting from the wing trailing edge to the aft end with the grain running crosswise. Pull the front of the fuselage together until the sides touch the motor tube, then attach the top sheeting from the nose to F3, and the bottom sheeting from the nose to the air scoop. This can best be done by notching the triangular stock, wetting the side pieces to make them more flexible, then tack-gluing them to the motor tube. To keep the motor tube from being pulled out of round, slide the motor back into the tube for this step, then remove it when finished.

Fill the space remaining between the fuselage and the motor tube with scrap balsa. Attach the 1/16-inch square strips between F3 and F5 set 1/16-inch from the outside edge of the side. This provides a flange to hold the turtle deck in place.

Now's the time to install the rudder cable and glue down the elevator cable. Soak the turtle-deck piece in water, then form over F3, F4 and F5, starting from the top of the turtle deck and working your way down both sides. (Use a fast CA for this step.) Sheet the fuselage bottom forward of the wing to the air scoop (grain runs lengthwise) and cut out a hatch to allow access to this compartment. If you plan to fly the Mistral regularly without landing gear, the 1/16-inch balsa between the air scoop and the hatch should be replaced with 1/4-inch balsa sanded to blend into the bottom contour. Install the wing hold-down block, and drill and tap using the finished wing as a guide.

(Continued on page 72)

MISTRAL

(Continued from page 70)

Now assemble the motor battery box from 1/16-inch balsa laminated with 1/64-inch ply. Use 3/8-inch triangle stock to reinforce the corners. Install hold-down blocks for the box, and drill and tap for 1/4-inch nylon bolts. Sand the fuselage round, then finish with your favorite covering material. I used butyrate dope on the original, with no measurable weight gain. For added durability with minimal weight gain, Micafilm can be used.

Install the motor and the radio. If this is your first electric-powered airplane, you might want a reference book to help explain all the details of installing and operating an electric power system. Mitch Poling's "Building and Flying Electric Powered Model Aircraft" (by Kalmbach) is an excellent choice. For motor control, a servo-operated microswitch or an electronic throttle may be used, as long as it's light. The landing gear can be omitted for the first few flights (or forever, for even better performance), and a skid may be substituted. The best material for skids is the clear plastic used to make large soda bottles. Just remove the top and bottom of a 2-liter or larger bottle, then cut the resulting cylinder to make a rectangular piece of the toughest, lightest, clear plastic available. Best of all—it's free! Attach the horizontal stab and hook up the elevator. Elevator deflection shouldn't exceed +/- 1/8 inch, with +/-1/2 inch for the rudder. Any more than this, and you'll have a real tiger by the tail! A Cox* gray 6x4 or 7x3.5 prop can be tried for first flights. (Prop selection is very important in electrics, and gives you something to tinker with now that you needn't worry about fuel mixtures and nitro content.)

PERFORMANCE: Balance as shown on the drawing, 2 inches behind the root leading edge. To facilitate initial test flights, arrange for the CG to be in the right place with and without the motor battery pack. Try a couple of hand-launches without the motor battery pack in place to check for any setup problems and to familiarize yourself with the handling characteristics. With a wing loading in the middle-to-upper teens (15 to 17 ounces per square foot), the Mistral is a fast and responsive flier. Make your hand-launches fast and level. Once you're satisfied that all is as it should be, install the motor battery and fly!

As with all electrics, give it a chance to build up flying speed before you start your climb. Once 'on the step,' climb-out will be brisk. Although Mistral has no ailerons, the roll control with the rudder is very pattern-like. Once a turn has been initiated, the rudder must be neutralized to prevent over-controlling. Also, up-elevator is required in turns. Mistral isn't meant to be a pattern trainer, but it can do loops, inverted flight, stall turns and rolls. It would even make an excellent mini pylon racer. At full power, three minutes of flying can be expected before power starts to drop and you need to start heading back to the field for landing. If you have two motor battery packs, you can swap packs, take right off again and fly while the first pack recharges. You can quietly have all this fun in the neighborhood schoolyard on a Saturday morning, and no one but you will know!

**Here are the addresses of the companies mentioned in this article:*

Astro Flight, Inc., 13311 Beach Ave., Marina

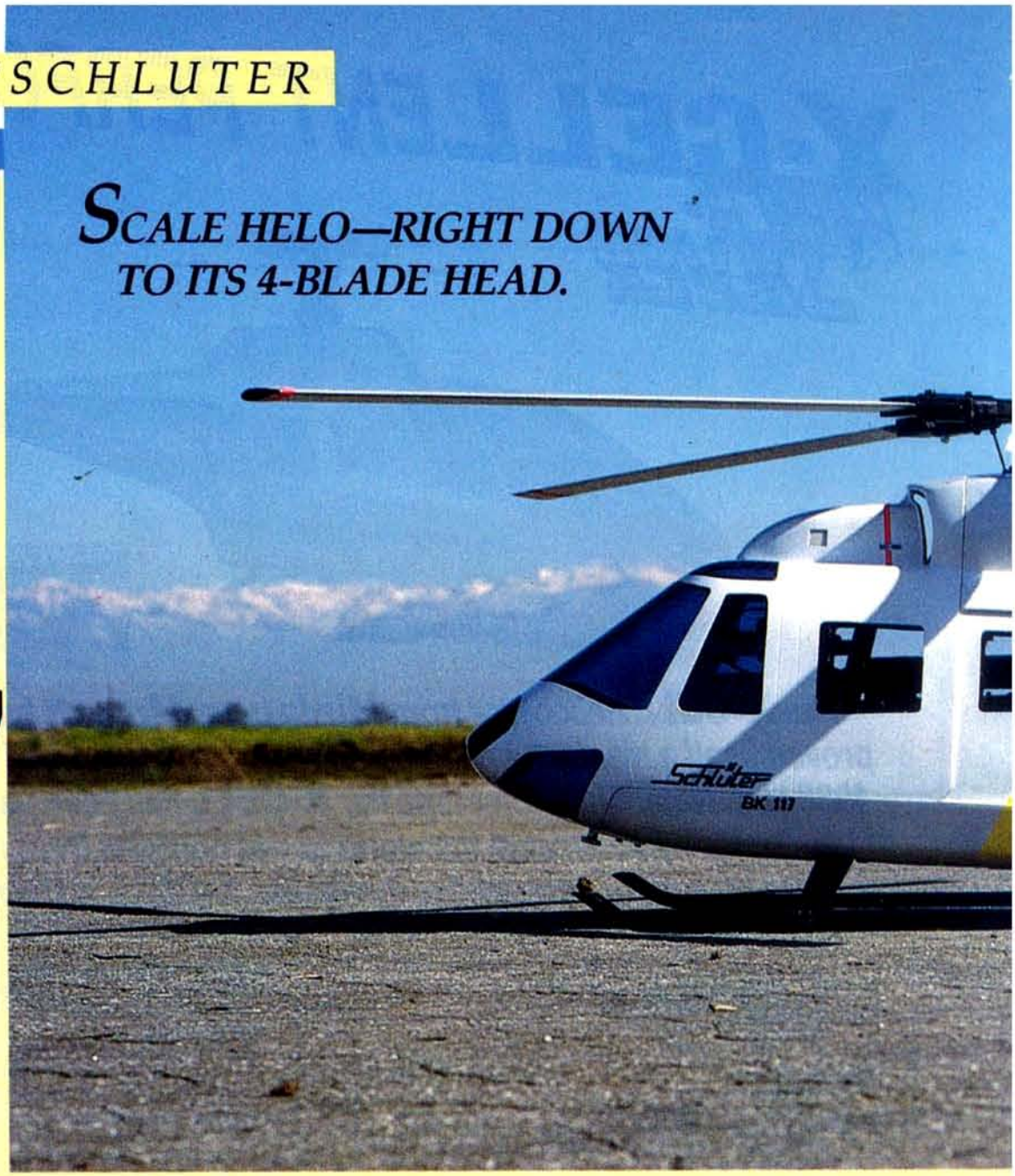
(Continued on page 80)

BK-117

SCALE HELO—RIGHT DOWN TO ITS 4-BLADE HEAD.

ROBBE'S* SCHLUTER BK-117 helicopter kit is one of the largest and best-looking available. Originally designed around System 80 mechanics, such as Heliboy, Superior, etc., it didn't find its true scale potential until the development of Champion's modular rotor-head design, which lends itself to two-blade or multi-blade configurations.

by DICK TRISTAO



Radio mechanical components to operate this system come directly from the new Scout designs that require mechanical or electronic mixing to slide the swashplate onto the main rotor shaft. This combination of components produces a model that links original System 80 and current designs. This is quite a feat, and it adds credibility to Dieter Schluter's design philosophy of "minimal obsolescence."

Scale helicopter models aren't new, but they've now traveled full circle from their early '70s beginnings. Most original kits were of scale machines with complex mechanics and beautiful fuselages. Unfortunately, many were built but never flown, as some modelers wouldn't put the effort into assembly and then beat the thing to pieces while learning to fly it. Later pod-and-boom designs offered freedom from arduous labor and gave ample strength to withstand beginners' abuse. Consequently, the scale machine almost became extinct. As helicopter fliers became proficient, the return to scale was a natural progression from look-alike dragonfly machines.

Robbe's BK-117 provides the helicopter modeler with a scale challenge that satisfies many cravings: scale appearance that can be as detailed as you want; mechanical assemblies that emulate full-size machines; and flying performance levels ranging from docile prototype to limited aerobatics.

Building the BK-117 is a delightful experience if you allow enough time and have some experience with fiberglass materials. Painting and finishing take most of the assembly time, so those who relish these tasks will be in heaven!

CONSTRUCTION: This centers on the fuselage and the specialized mechanical components that transform a basic pod-and-boom helicopter into the BK-117. Champion and Superior owners can buy the necessary conversion parts for the multi-blade application, while Helistar converts are limited to the two-blade system. Scout 60 owners can move to

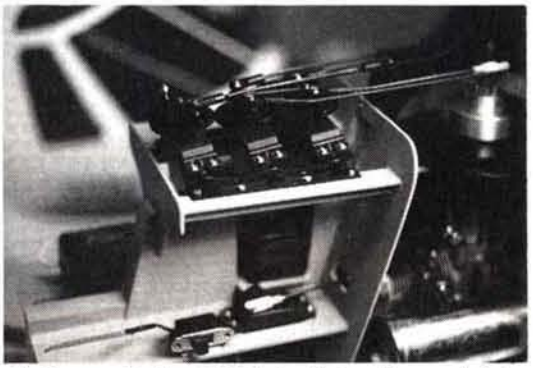
Photos by Dick Tristao.

this machine by buying only a multi-blade head.

As mentioned in the building instructions, the fuselage can be built without having already-assembled mechanics on hand. Although my kit was new (including the Champion mechanics), I thought that most modelers would add the BK-117 to a stable of existing mechanics. My plan was to completely assemble and finish the fuselage, and then to see if the mechanics fit as advertised. Three variants and the position of the wooden reinforcements are shown on the full-size building plan. A few cutouts are the only changes needed for Champion, Superior or HeliStar mechanics; Scout 60 owners can use the drawings and

A crystal sky is home for the BK-117, as smooth curving maneuvers are performed against the backdrop of California's majestic Sierras. Flight performance is predictable and trouble-free.

Modular head is light, strong and easily disassembled for maintenance. By changing center hub, the pieces can be reassembled into a three-blade configuration or flybarless two-blade.



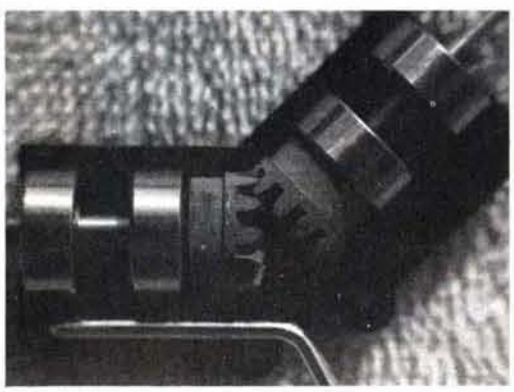
Radio mount is Scout .60 design that rocks swashplate control servos for collective pitch. Simple system accepts any size servo and smoothly powers up/down swashplate movement with minimum servo strain.

BK-117

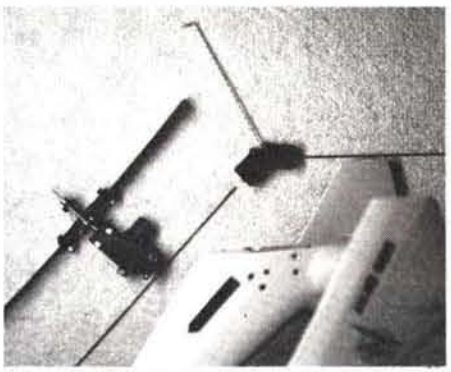
instructions for the Champion.

The love/hate work begins with cutting the window opening in the fiberglass fuselage. Cuts are also made for the dummy exhaust outlets, the exhaust and cooling air exits and the scale screen areas. Tail-boom cuts for transmission(s) mounting and horizontal stabilizer are also made. This takes several hours. If you work carefully within the molded and scribed areas, the fit of the plastic window is perfect. A

High placement of tail rotor minimizes induced roll when tail-rotor control is applied. Optional extended Schluter blades were fitted to reduce amount of pitch needed to counteract massive main rotor torque.



Bevel-gear transmission transfers power up the tail boom along two drive shafts. A plywood and transmission sandwich slips into the tail-boom bottom and allows minor adjustment for driveshaft alignment.



Scale outline is accurate enough to accept detailing to any degree. Window, vent, duct and bolt-holes are marked for the builder, and align accurately with the parts.

little top and bottom seam sanding completes the main fuse and boom for the final fitting of wooden reinforcements and mounting hardware. The white gel-coat finish on Schluter's fuselage is of the highest quality, and if you work carefully, it can be the base coat of your color. Add a little complementary or contrast trim, decals, a final coat of clear sealant, and you'll have the lightest, fastest available finish.

Wooden reinforcements are cut from the provided plywood material by tracing shapes directly from the plan. Rough-cutting and final sanding to the desired outline will produce parts that fit snugly. Drill and/or cut all the holes, slots, etc., before gluing, as some areas will be almost impossible to correct later. Landing-gear hardwood blocks adhere to the fuse bottom and must be pre-drilled and placed according to the mechanics used. The center hole on the rear block needs to be slotted about 4mm deep by 4mm wide across the short dimension to allow easy installation of the rear of the mechanics. A bolt protrudes downward from the rear chassis at this point, and things go together more easily if this slot is present.

Fitting of the cabin attachment pieces takes a little time but helps join the flexible main body and the multi-window cabin piece into a fairly rigid shell. Three thumbscrews anchor the assemblies together. They do detract from the scale appearance, but I chose not to deviate from the standard kit. Purists can devise a hidden attachment system to suit their tastes. At this point, the windows were cut from vacuum-formed sheets, leaving the recommended 2 to 3mm lip around the raised portion. These windows are designed to attach from the inside of the fuse and fit flush to the outside. If you didn't go crazy with files and routers during the cutting phase, the windows will fit perfectly into their respective openings.

Factory-assembled blades need light sanding, covering and balancing. Four blades can set up quite a shake if improperly balanced, so accuracy is a must.

The tail boom necessitates a fair amount of work with the two tail-rotor transmissions, horizontal stabilizer and vertical fins, tail-rotor drive-wire tubing and nyrod-type control cabling. A number of wooden formers act as

(Continued on page 101)

Even when sitting still, the Flash has a purposeful look. The color graphics in the kit give the Flash a nicely finished look.

FLASH EP

The author's wife, Mary, holds the Flash in a picturesque park setting. Quiet electric models can be flown almost anywhere.

SPECIFICATIONS

Span: 47 inches
Weight RTF: 42 ounces
Length: 34 inches
Wing Area: 348 square inches
Dihedral: 2 degrees
Wing Loading: 17.4 ounces/square foot
Motor Unit: LeMans 240E w/integral reduction of 3.46:1
Propeller: 9x8 specially designed for electric power
Battery: 7.2V or 8.4V; 1200mAh
Radio Required: 4 channels (rudder/elevator/aileron/speed controller)
Manufacturer: Kyosho Price: $239.95

The Flash is somewhat difficult to hand-launch, but the good power-to-weight ratio makes it easy to correct and get away without incident.

THIS ARF LETS YOU FLY BETTER—ELECTRICALLY

by JOHN LUPPERGER

The Flash strikes a pretty picture as it flies by. Model is rock-steady whether flying fast or slow.

BECAUSE GREAT PLANES Distributor* advertises the Flash as being capable of "true aerobatic pattern performance" on only 7-cell operation, this review was unusually challenging. I've seen aerobatic performance from a 7-cell electric before, but I've *never* seen it from an electric ARF, and I have both the Kyosho Zero and the Petit Robin. The Zero is capable of rolls and loops, but its aerobatic capabilities aren't "pattern like," and the Robin isn't *at all* aerobatic. Well, the gauntlet was thrown down, so let's see what happened!

THE KIT: Since my kit appeared to be Japanese made, and as there were no instructions in English, I can only comment on the clarity of the drawings. The boxes of all Kyosho kits display full-color pictures that really show off the finished model, and this really inspires you to get right to the task of assembly.

The main parts (e.g., the fuselage, wing, and tail surfaces) were protected by plastic wrap, and the small parts and hardware were wrapped separately to avoid damage during shipping.

The fuselage is of LSS polyolefin resin, a plastic material whose lightness and flexibility make the plane fairly crash-resistant. The wing is a conventional D-tube, balsa, built-up structure that utilizes a semisymmetrical airfoil. The tail surfaces are balsa and, like the wing, are covered with a polyester film similar to Solarfilm. The cowl and wheel pants are made of the same material as the fuselage, and the canopy is a smoky, clear plastic. The motor, gear drive, prop, spinner and all hardware are included, so you'll only need to buy epoxy and CA. The quality of all parts was top-notch.

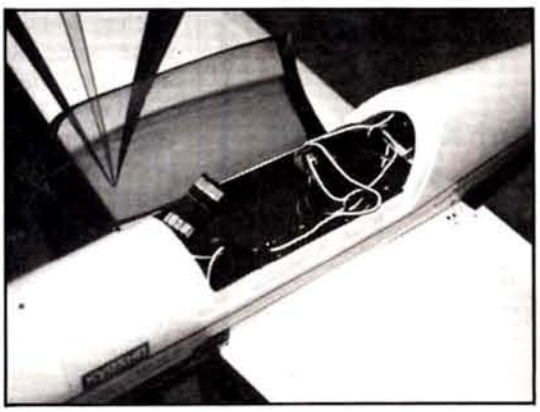
There are no full-size plans, as they aren't needed with an ARF model. The 12-page construction booklet has clear, easy-to-follow line drawings. A graphics trim sheet is also included, to help you make the finished model look as good as the pictures on the box.

CONSTRUCTION: The construction booklet is very explicit (even though my copy was in Japanese!) and the line drawings made most steps very easy to follow. All parts are clearly identified, and the screws, nuts, bolts and washers are even shown full-size.

The first step is to mount the wheel pants and wheels to the dural landing gear. The axle is a 3x20mm bolt with one nut inside the wheel pant and one on the inside of the landing gear, but there isn't enough room for a nut and a wheel inside the wheel pant. To solve this problem, I mounted both nuts on the *inside* of the landing gear and tightened one against the other. The landing gear was then bolted to the fuselage with two 3x15mm bolts and lock nuts.

Vacuum-formed tips of extremely lightweight ABS-type plastic are supplied for the tail surfaces and the wing. After trimming the tips from the plastic sheet, a strip of the covering is removed from the tail and wing surfaces and the tips are glued on with CA. The trim graphics are

(Continued on page 110)



The flight pack fits in a tray in the canopy opening. Receiver had to be moved to rear of flight-pack area to achieve the proper balance.

The "GO" bits. The gear drive is made of glass-filled nylon parts, making it more durable than the older aluminum Kyosho units. At half-throttle setting it's possible to cruise and climb, so greatly extending the flight time (about 3 to 3½ minutes with mAh pack).

MISTRAL

(Continued from page 72)

Del Rey, CA 90292.

MonoKote; distributed by Top Flite Models, 2635 S. Wabash Ave., Chicago, IL 60616.

Cox Hobbies, Inc., 1525 East Warner Ave., Santa Ana, CA 92705.

Carl Goldberg Models, Inc., 4734 West Chicago Ave., Chicago, IL 60651.

Sig Manufacturing Co., 401 S. Front St., Montezuma, IA 50171. ■

SOARING SCALE

(Continued from page 27)

flew very nicely with lots of penetration capability. Two very nice scratch-built models from plans were in attendance: a Grunau Baby by Frank Smith and a Schweizer I-26 by Randy Holzapple, both of Spokane, WA. Surprisingly, there were three Jantar 1s entered: Ray McGowan of Napa, CA, entered one that sported a very nicely detailed canopy and cockpit. Scratch-built from the entrant's own plans was the Colditz glider built by Steven Pepke of Issaquah, WA. This model was patterned after an unusual glider built by American POWs during World War II; the original never flew. There were so many beautiful gliders that it was hard to see and remember them all, but from a builder's point of view, the scenery was most pleasing, as well as informative.

Late arrivals appeared all day, some traveling quite a distance, like Pat Czpala of Genoa, NE. Weather conditions continued to be most "soarable" well beyond our 5 p.m. scheduled end to formal frequency control. As a result, many fliers remained on the hill enjoying the lift, as they didn't know what weather tomorrow would bring.

Others packed up and headed for the Washington Wine Tasting, which Pete Bechtel, Jon Waddoups, and I hosted. Much thanks goes to the wives who pitched in and did a great job of putting some order into what could otherwise have been chaos. The wine tasting provided a relaxed, informal atmosphere to chat with some of the very special people who had traveled far to share their soaring experiences. At about 12:30 a.m., as I made my way to bed looking back on what a great day it had been, I was completely confident that tomorrow would be another outstanding soaring day.

My 14-month-old daughter, Elizabeth, woke me at 5 a.m. to witness a most unusual sight in the desert; it was raining and raining *hard!* This seemed

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SOARING SCALE

(Continued from page 80)

nothing to fret about, since I was positive that it would last no more than an hour or two. After all, this had been a *dry* year. We received *17 percent* of our annual rainfall that day; over *an inch!* It rained until about 2:45 p.m. and then, in line with a local saying, "Wind follows rain," it started to blow. There had been some flying early in the morning between rain showers, and now these hearty souls returned to the slope and were able to fly until about 7 p.m. The flying might have continued until dusk, but the banquet was at 8 p.m., and this forced an early end to flying on a very unusual day.

The banquet started with a social hour and a video, "The Quiet Challenge," provided by Tony Palethorpe of Grass Valley, CA. The video featured some outstanding footage of full-size soaring craft at Baron Hilton's soaring ranch in Nevada. One hundred and twenty-four people attended, which shows how many people came just to watch the event.

The banquet's high point was the speech by guest speaker, Bob Moore. Bob gave a short history of full-size soaring, focusing specifically on Northwest soaring. His presentation included slides that he'd specially selected from his more than 1,200 slides of soaring. Additionally, he narrated the story of Cloyd Ortman, who designed and flew a primary glider, similar to an S6-38, and who played a trumpet while he flew. Apparently, he did this as a signal that his sister should turn on the Model T Ford's headlights so that he could land in the dark.

At the end of the banquet, several people asked me to predict what winds could be expected on Sunday. I'd learned my lesson from Saturday, so I looked out of the window at the flag blowing in the breeze, and then, once again, confidently told them the weather would be great!

Well, it *did* turn out great. Frequency control was implemented by 8:15 a.m., Gene Cope was again the first to launch, and it was immediately obvious that the lift was good. The pits began to fill with gliders and the mood of the fliers created an up-beat atmosphere.

Rumors had been spreading all weekend about a Northrup YB-49 flying wing that was supposed to fly. The rumor was true: A 14-foot span, 4,000-square-inch, 35-pound, YB-49 had been deposited in my garage on Wednesday night by the Seattle Area Slope Soarheads (SASS). The wing was the work of all club members and was a sight to behold, even on the ground. When club members had assembled it, the wing was ready for launching. A crowd gathered, everyone following the wing to the far end of the slope. Wing men were Jim Rauch, Rick Edris, and Bill Vukonich, and the pilot was Ken Stuhr. The launch time came, the wind was right, the launch command was given, and it *failed*: The wing stalled! Fortunately, this wasn't the end. They surveyed the damage, evaluated the launch problem, and headed for the pits to make repairs. The repairs were minor, so after about an hour they were ready to make another attempt. The crowd wondered if the machine could really fly.

Rauch was the boom man, and he decided to give the YB a good solid push to avoid another stall. All wing men held on until the conditions were right, then away it went. Seeing this was quite an experience, and it was the icing on the cake for a weekend of soaring experience. The YB-49 even sounded realistic

(Continued on page 87)

Giant Steps

by DICK PHILLIPS

P-47 Razorback by Shailesh Patel from the Bert Baker kit. Flies superbly.

AN EVENT THAT OCCURRED a couple of thousand miles away reminded me that we can't ever be too careful when flying models. As many of you know, scale expert Colonel John A. de Vries is my partner in a small publishing venture. The Colonel and I are in touch by telephone/modem at least twice a week. He called today to tell me he'd been hit by a model at the local flying field and would be out of touch for a few days. It seems that a modeler lost control of his airplane on takeoff; it flew into a signpost and broke, its engine striking Jack's back. He had a huge bruise for a few days and was ordered to stay on his back for a while, but fortunately, it doesn't appear that there will be any lasting ill-effects.

Had the sign not been where it was, or had the model flown into Jack without having been slowed down, the accident could have been much more serious. This should remind us that safety is something of which we must always be conscious. I don't know whether or not this accident could have been prevented, but if we *always* take *every* precaution to ensure that we're flying as safely as possible, such accidents won't happen.

We should also be prepared to accept some risk when we attend a flying site. Most of us have seen accidents happen and are aware that they're always a possibility. We should be alert whenever flying is taking place, so we can get out of the way (if possible) when things go wrong.

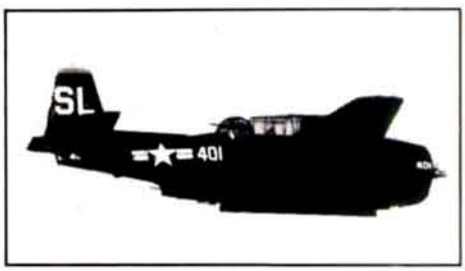
For the benefit of those who aren't "regulars," and who may not be aware of the dangers, it might be a good idea to have a sign posted at the club site. I suggest something like this:

While every precaution is taken to operate this site in a safe manner, radio control is occasionally subject to signal failure. Please be observant while you are our guest. Keep your eyes on the model(s) being flown.

In posting such a sign, we're at least letting the uninitiated know that there are potential dangers.

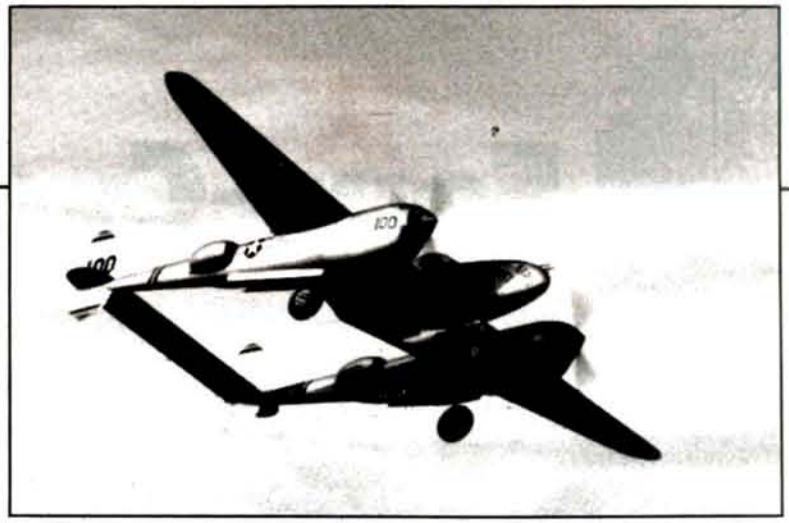
Useful Books

As I'm a writer and publisher, it's not surprising that I think books are important. There's no substitute for practical experience, but you can learn a good deal from books. My collection ranges widely in subject matter, and, as you might expect, airplanes and aviation are well represented. Model aviation doesn't take a back seat either, and my library contains a few items that are getting close to being collector's items.



Dennis Crook's well-known TBM with torpedo bay doors open. Hard to tell from full-scale plane.

Photo credit to Dan Parsons, Albuquerque, NM, with thanks for sharing them with us.



Chuck Fuller's 126-inch-span P-38. A pair of Zenoah G-38s drives this beauty.

Among the full-scale material are three books that I've come to regard as indispensable to the large-scale model builder. They're published by the Experimental Aircraft Association* (EAA) and are available to anyone through EAA's office in Oshkosh. "Wood Aircraft Building Techniques," covers in some detail the building (and initial flying) of Peter Bowers' Fly Baby. This book will provide a wealth of valuable information for anyone who is building a scale Fly Baby (from the Balsa USA* kit or otherwise). The book is devoted almost exclusively to the Fly Baby, but don't let this deter you; the information it contains is valuable in building any model with wood.

Volumes 1 and 2 of "Building the Custom Aircraft with Wood" refer to specific construction of a number of home-built airplanes. Don't let this turn you off; if you're like most of us, *reading* about airplanes is recreation too! In addition, these two slim volumes contain considerable information that will be of value to large-scale construction projects. Oh, there are things with which we need not concern ourselves; our models won't be lifting us into the sky, after all! Despite that minor reservation, these two books contain a wealth of information you'll find useful in the construction of your next large-scale model. The subjects discussed include selection of wood, types of glues and their advantages and disadvantages, construction methods and materials. The construction techniques describe a wide variety of full-scale home-built methods for assembling and testing airplane sub-structures. Some of this material doesn't apply to the building we do, but there's a wealth of good information available.

I bought my copies of these books some time ago and, at that time, they cost about $3.50 each. They may be a little more expensive these days, but they provide excellent information.

There *is* a drawback to having these books on hand: They lead to the temptation to have a go at a home-built yourself. Those of us who build large models have been described as "frustrated home-builders." Reading the three books mentioned may convert you from a "frustrated" to an "active" home-builder! I know I was itching to get a set of Pete Bowers' Fly Baby plans and match the 1/3-scale version now resting in the workshop next to my office. Hmmmm...let's see, I'll need a bunch of Sitka spruce for those spars, and a couple of acres of aircraft plywood...and I'd have to refinish the 1/3-scale Fly Baby to match the full-scale paint job...Hmmmm...maybe I'll wait a while! There's another item to add to my list of "someday" airplanes!

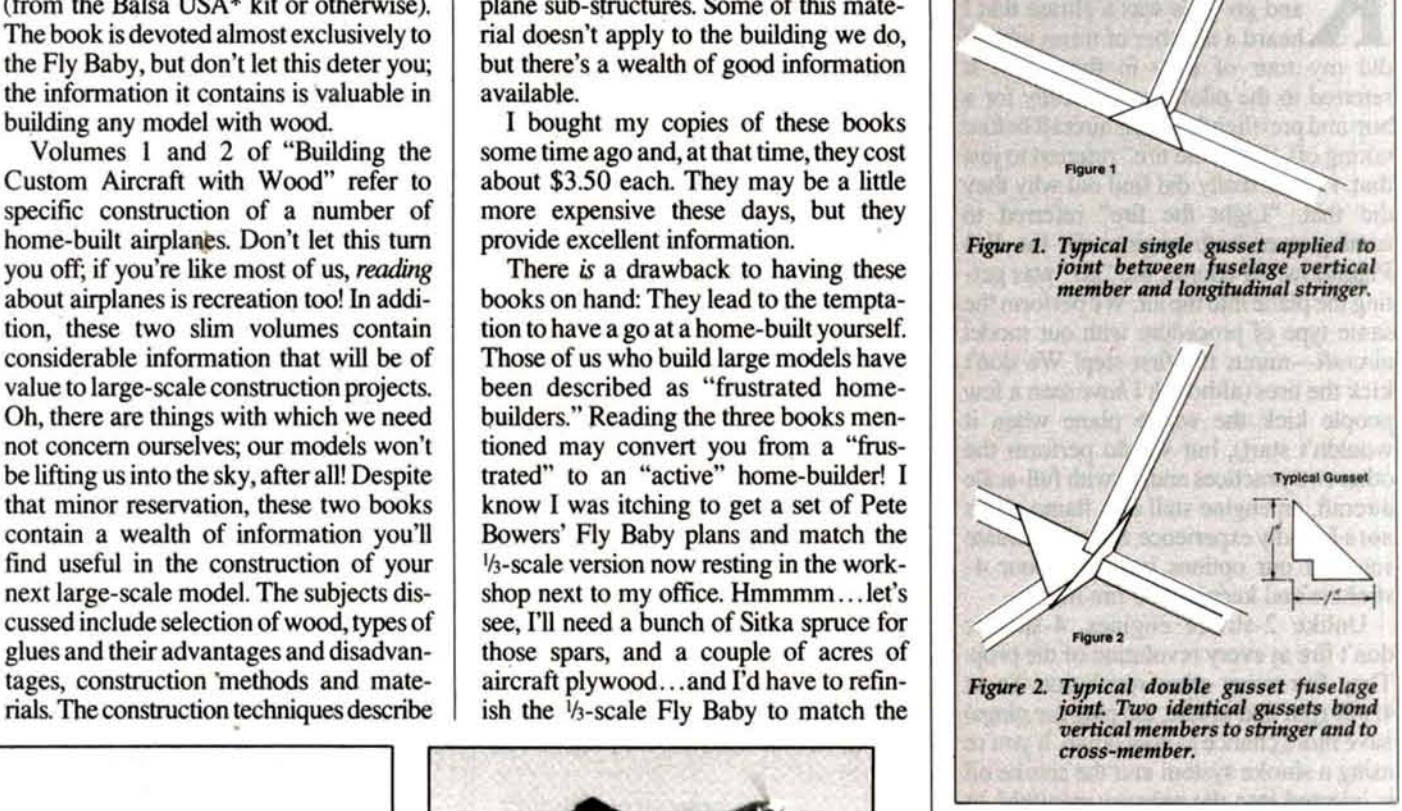
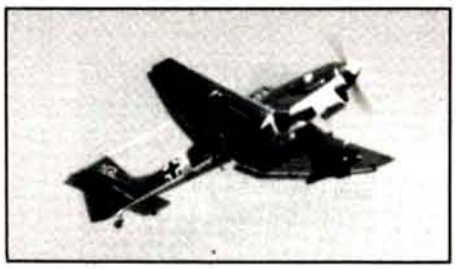


Figure 1. Typical single gusset applied to joint between fuselage vertical member and longitudinal stringer.

Figure 2. Typical double gusset fuselage joint. Two identical gussets bond vertical members to stringer and to cross-member.

Scratch-built Maule designed and built by Claude Tanner of Boise, ID.

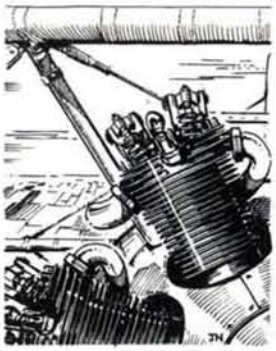


One-fifth-scale Stuka, scratch-built by Bob Francis from his own plans.

Simple Modification

All this isn't to suggest you can learn *everything* from books; *practical* experience comes from building. Whether you

(Continued on page 114)



Four-Cycle Forum

by CHRIS ABATE

House of Balsa's Pietenpol Air Camper O.S. 40 4-stroker for those laid-back Sunday afternoons.

Just when you thought it was safe to go into the air! Dave Rigotti's Big Stick 60 with O.S. 120 4-stroker doesn't lack in vertical performance.

KICK THE TIRE, light the fire and go. This was a phrase that I heard a number of times while I did my tour of duty in the Navy. It referred to the pilots getting ready for a hop and pre-flighting their aircraft before taking off. "Kick the tire" referred to just that. I never really did find out why they did that. "Light the fire" referred to turning over both engines on the F-4 Phantoms. Of course, the "go" was getting the plane into the air. We perform the same type of procedure with our model aircraft—minus the first step! We don't kick the tires (although I *have* seen a few people kick the whole plane when it wouldn't start), but we do perform the other two practices and, as with full-scale aircraft, an engine stall or a flame-out is *not* a friendly experience. So let's evaluate some of our options in starting our 4-strokers and keeping the fire lit.

Unlike 2-stroke engines, 4-strokes don't fire at every revolution of the prop: They fire every other revolution. So at lower rpm and at idle, the plug (or plugs) have more chance to cool down. If you're using a smoke system and the smoke oil is injected into the exhaust manifold, at low rpm, you really increase the risk of cooling the glow plug to a point where the "fire" will go out.

Let's look first at how we can light that fire. The most common system is to hook up a glow-plug driver to a battery and then connect it to the glow plug to light it off. This usually works very well with our engines, but we may want to light more than just one glow plug and also keep it lit at all throttle settings throughout the entire flight.

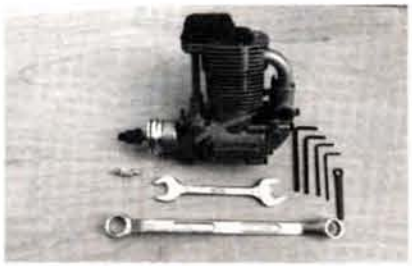
Some engine manufacturers supply glow-plug leads with their multi-cylinder engines. All you have to do is to connect the ground wire to a part of the engine (one of the back-plate cover bolts works well) and the other wire to each glow plug. You'll need some kind of hook-up from your glow-plug driver battery. A trip to a local electronic-supply store will solve this problem, as you only need to buy a female/male plug jack. (Some of you may be more familiar with the term banana plug and jack.) Just remember that the male (or banana) plug must be able to accommodate both positive and negative currents, and this also holds true for the female receptacle.

The female receptacle should be the type that can be secured to a cowl or through the fuselage by drilling a hole and then locking it into place with the nut that's supplied with the package. You should also use the smallest one available, as it will be less noticeable on the airplane.

There are also some new items on the market that you can use with multi-cylinder engines. Martin Forrest Designs packages glow-plug hook-ups that consist of a male/female jack for power from the battery and two wire leads (one for grounding and one for the glow plug). The glow-plug lead is a spring type. To hook onto the glow plug, you push while turning clockwise, and to disconnect, you pull while turning counterclockwise. The system can easily accommodate multi-cylinder engines—simply add more glow-plug leads. McDaniel R/C Inc.* has an addition to its fine product line: a unique device that they call their on-board ignition system. This system allows you to activate the glow plug(s) from the on-board glow battery and it also allows you to select the setting at which the power will be supplied to the plug(s) via your transmitter. This is done electronically

(Continued on page 88)

Davis Diesel Development's 4-stroke muffler claims low dB levels without power loss.



Futaba's YS 120 SF 19.96cc displacement—full evaluation coming up.

McDaniel R/C Inc. on-board ignition system uses LED to indicate when power is being supplied to plug.

SOARING SCALE

(Continued from page 83)

as it whooshed past. The crowd truly had what it came for: a most unusual weekend of soaring scale gliders.

The people who participated in the first ever National Fun Fly are fantastic—genuine soaring enthusiasts who make all the work worthwhile. They are especially unusual because they aren't driven to compete in a formal contest, but participate in events like this to enjoy the fun of flying and to share their love of this hobby. These people are talented builders and pilots, and good sports.

We plan to do this again in 1989. Using the thoughtful evaluations received, we will, of course, try to add to and improve this Fun Fly.

Start planning now to attend the first *International* Scale Fun Fly on Memorial Day weekend (May 25-28) 1989. Your model must be a scale replica of a full-size glider, or a glider that replicates a full-size power ship. Beyond that, the AMA safety code applies, and the rest is just flying and fun. We're attempting to make this an international event, which we hope will attract entrants from Europe and elsewhere. We also hope that a manufacturers' trade show will be held with the Friday night "social" so that you'll be able to see what to buy next. Your attendance in 1989 could mean that 1988 was just the *beginning* of something new and totally enjoyable in R/C soaring. Remember this is for fun, and all you need to do is to come and show off your scale model.

One last thank you to all the club members who worked so hard to make this such a success! ■

LOADSTAR

(Continued from page 39)

drops down out of the fuselage for easy access to your payload equipment. The whole design is an interesting variation on an old theme—the high-wing monoplane. Because of the need to maintain a totally open center bay in the fuselage for the payload, radio equipment must be located elsewhere. Therefore, just behind the engine fire wall you must shoe-horn in the fuel tank, receiver, Ni-Cd, throttle servo, battery switch, charging jack and their interconnecting wires and tubing.

After deciding on a suitable arrangement for all these components, it should be easy to fit the rudder and elevator servos into the plywood tray designed for them at the tail end. I deferred that rear-end installation until the wing and tail feathers were built, so I could get an indication of how the ship would balance out. It's a good thing I did, because the two servos at the tail made the balance come out decidedly tail-heavy. Final proper balance was achieved only after the rudder and elevator servos had been moved to the top of the fuse, between the wing roots. This didn't change anything else, apart from adding the need for nyrod pushrods back to the tail surfaces. Several internal stiffening frames were needed to support the nyrods in the interior of the fuse, and these must go in prior to covering.

The wing is built in two halves that slide onto heavy plywood braces protruding from the fuselage. After the wings have been fit snugly against the fuse, a set of functional struts is mounted in place to carry a part of the wing load. The wing panels are made of balsa ribs, spruce spars and sheet balsa leading and trailing edges. The panels are rugged but not

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FOUR-CYCLE FORUM

(Continued from page 86)

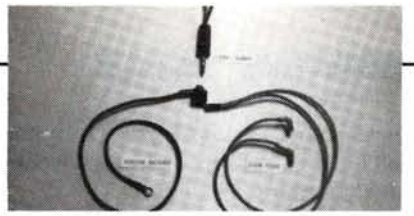
(not mechanically) through a digital power switch. This digital power switch is designed to replace a servo-operated microswitch. This means that when the transmitter and receiver are both on, you can adjust the setting at which you want power on or off to the glow plug. When the LED is glowing, power is being supplied to the plug. If you elect to have power off to the plug at one-quarter throttle, turn the small variable resistor until the LED goes off. This will indicate that power is no longer going to the plug. You can set power on/off at any throttle setting.

The pulse width is adjustable from .8 to 2.2 milliseconds. The broad adjustability makes this unit compatible with any transmitter you may have, and it can be activated from any channel, not just throttle (e.g., retract switch).

This is a big plus: It ensures good idle and prevents a plug going dead at idle when you're in the air. How many of you have had a plug go out at the backside of a loop when you throttle down and have the smoke system on? End of flight! Or how about keeping that smoke system on during that stall turn?

I'm presently using this system on my Sig* Spacewalker with a Saito* 2.70, with power to the glow plug coming off just below one-quarter throttle setting. I like it! With the power switch and on-board Ni-Cds, the weight addition was approximately 8 ounces. If, like me, you forget to charge the on-board glow battery, you can use external power via the charging jack that you would use to charge the on-board glow battery. (This is *with* the use of the external/internal switch.) Ask for literature that covers on-board ignition kits No. 175, No. 176, No. 177 and No. 178.

Engine manufacturers supply glow-plug leads with the multi-cylinder engines. O.S. 120. Twin shown with glow-plug leads.



Martin Forest Designs single- and multi-cylinder glow-plug system.

Most of all, I enjoy it when people are watching. They tell me that I forgot to hook up glow power, but I simply start up. They gape in amazement. How did he do that?

Up and coming: Running the Y.S. Futaba* 120SF 19.96cc displacement—killer! From Davis Diesel Development* comes a muffler system that greatly reduces dB levels *without* loss of power!

**Here are the addresses of the manufacturers mentioned in this article:*

McDaniel R/C Inc., 12206 Guinevere Rd., Glenn Dale, MD 20769.

Sig Manufacturing, 401 S. Front St., Montezuma, IA 50171.

Saito; distributed by United Model Products, 301 Holbrook Dr., Wheeling, IL 60090.

Futaba Industries, 555 W. Victoria St., Compton, CA 90220.

Davis Diesel Development, P.O. Box 141, Milford, CT 06460. ■

LOADSTAR

(Continued from page 87)

over-built or too heavy. I found that the pre-cut wing strut members weren't an accurate fit, but since they were a little too long, adjusting their length was easy. The wings have one flap and one aileron for each panel, and each of these has its own servo with an access door at the servo location. This makes four individual servos in the wing, with a lot of wires and connectors to be fitted together when setting this plane up to fly.

The tail feathers are of built-up balsa construction that includes a very heavy balsa perimeter with intermediate ribs. I suspect the rudder and elevator surfaces are strong enough to withstand a three-megaton blast! This also partly explains why my plane came out orginally with a tail-heavy balance that led to my relocating those two aft-end servos!

I used 2½ rolls of white and one roll of yellow Black Baron* film to cover this craft, and black striping tape for trim. There are no complex surfaces to cover, so film application is very easy. The completed airplane has proven to be nice-looking, clean and crisp in the air.

I feel compelled to make one comment about building this kit. The plans consist of one 3x4-foot drawing, and the instructions are on one 2x3-foot sheet, which contains 25 photographs. Under each photo is a brief explanatory note (in Japanese and in English) describing the construction step. I didn't have much trouble following these photo/notes, but a beginner might have some difficulty. If you're a beginner, or "low-time" model builder, don't hesitate to ask the advice of a more experienced builder if you get confused!

PERFORMANCE: Here comes the fun part. This plane will take off in less than 10 feet with flaps down and a very modest breeze blowing. It will land in much the same way, with almost no roll-out required when that gentle head wind slows things up. The plane climbs to lofty heights in practically no time at all, but flies at low speeds for ease of control and good visibility.

There's much to be said for the joyful experience of controlling a plane that can almost hover in light breezes. Too many of us have forgotten that joy in a quest for dazzling speed and gut-wrenching aerobatics. The Loadstar will definitely offer its pilot a rewarding and happy flying experience; it's a *ton* of fun!

MAN Editor, Rich Uravitch, is in the process of completing a glider which, he tells me, will be available to try out with the Loadstar launching rack. Please stay tuned for an article on the Loadstar/glider joint venture.

**Here are the addresses of the manufacturers mentioned in this article:*

Hobby Shack, 18480 Bandilier Cir., Fountain Valley, CA 92728.

O.S.; distributed by Great Plane Model Distributor, 1608 Interstate Dr., P.O. Box 4021, Champaign, IL 61820.

Black Baron; distributed by Coverite, 420 Babylon Rd., Horsham, PA 19044. ■

AIRTRONICS

(Continued from page 41)

servo rails were built up slightly, and all four servos fit snugly in the fuselage. The flaps are actuated at the wing's root by plug-in linkages that control the entire surface from root to tip. Rudder and elevator are both actuated by full-length cables. The standard servos handled all surfaces with no problems and always centered perfectly.

On the Caramba, each flaperon is controlled by its own servo. To be able to adjust for differential, each flaperon servo

AIRTRONICS

uses an individual receiver output. So, although you can actually hook up and use seven servos, two will be dedicated to the same function, which is why the radio is actually a 6-channel unit. The flaperon function uses the pulse mixer, which is illustrated in the instruction booklet. When using the pulse mixer, it's only possible to use one mixing function at a time. The pulse mixer is capable of giving you one of three different mixing arrangements (flaperons, elevons, or V-tail) but not all three, or any combination of the three, simultaneously.

Since the Caramba has full-span flaps, the flap-mixing functions were also used. The flap-mixing switch gives you three flap options: elevator/flap mix, flap/elevator mix, and one preset flap position. With the flap switch in the rear position, you get elevator/flap mixing, and it's possible to mix the amount of flap from 1 to 100 percent. When flying a speed course, this would be used to get the fastest possible turns without producing a high-speed stall. As you apply up-elevator, the flaps move down to create more lift, and thus a very quick turn. In the center position you get flap/elevator mixing, which gives you elevator compensation when the flaps are lowered. You can adjust the amount of down-elevator to keep your glider in the proper nose-down attitude during landings.

In the forward position, you get a flap preset. This allows you to set your flaps to exactly the same position each time for launching. By using the "flap 2" trim pot under the front panel, this preset can be set from 1 to 100 percent of the flap travel. The instruction booklet covers all four versions of the Module Series and refers you to the 7P for setting up the flap mixing. The flap arrangement on the 7P is different and calls for two presets, although there's only one on the 7SP. It's also important to set the flap spoiler select-switch in the flap position if you want to use the preset. It can also be set in the spoiler position so that the flaps are controlled by the throttle stick rather than the auxiliary channel lever, which is located on the left side cover of the transmitter. When using the throttle stick to control the flaps, the preset is disabled.

Most gliders with ailerons can benefit from aileron differential. This is even more important on a model with full-span flaperons such as the Caramba, where the drag caused by the downward-deflected aileron can cause extreme adverse yaw. In some cases, a glider will actually start a turn by first swinging in the opposite direction from the intended turn. By combining the travel adjustment and the differential adjustment on the front panel, it was possible to end up with a differential of about four-to-one (more up than down). I also used the aileron/rudder mixer, since in real aircraft the rudder is used in coordination with the ailerons to control adverse yaw. This, combined with the differential, eliminates adverse yaw completely. The amount of aileron-to-rudder mixing is completely adjustable from 0 to 100 percent. The rudder travel can also be adjusted for more, or less, independent right and left travel. This can be very helpful in compensating for linkage hook-ups, one of which may produce more throw than the other.

The elevator also has several possible adjustments. On the front of the transmitter there's an elevator preset trim switch. This gives you two presets that could be used for best glide angle, high-speed glide, towing, landing, etc. "Down" sets position one, "center" is disabled, and "up" sets position two. I set mine up for best glide in position one, and best search trim in position two. The elevator can also be set for independent up or down travel with the travel adjustment pots.

The final adjustments to be made before flying are to the dual rates. Both adjustment pots are located under the front panel, and both rate switches are located on the upper front of the transmitter case. The dual rates allow you to adjust your travel down to 40 percent of the total on the aileron and elevator channels. When either dual rate is on, one of the two power LED lamps that corresponds to that channel will blink. This visual indication that a dual-rate switch is on can really help the pilot. It's nice to be able to glance at the transmitter before launching, and to quickly know what's going on.

Flying with the 7SP

The test flights were done in the early morning, in very calm conditions. It's usually necessary to make many adjustments once flying starts, and at this time of the day the model is less affected by wind and thermals. On the initial launch, I opted not to use any flaps, as I first wanted to get used to the feel of the radio. Everything was working well, and the model needed no trim adjustments. The differential in the full-span flaperons

(Continued on page 94)

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Because of the ever-increasing growth and specialization of the radio-control hobby, the old standby generic R/C magazines just don't cut it! One magazine can't possibly address R/C airplanes, cars, and boats effectively and they end up being diluted and ambiguous. ***Model Airplane News, Radio Control Car Action,*** and ***Radio Control Boat Modeler*** give the airplane, car and boat consumers just what they want. Don't duplicate and waste precious ad dollars—go right to the source with these super-high-quality, aggressively marketed publications. Call Fred Murphy toll-free at 1-800-243-6685 for more advertising info!

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Floating Around

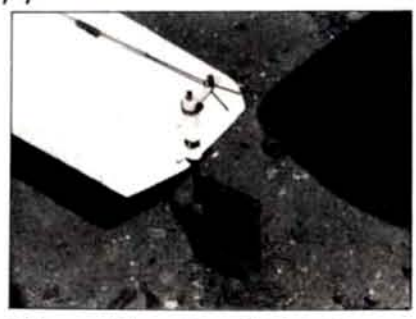
by JOHN SULLIVAN

The Maru taxis out for its maiden flight. A fiberglass cowl will be added after flight evaluations.

I'VE JUST READ a report on the Ace* family Float Fly in the Byron Originals* newsletter. Despite the fact that this was Ace's first float get-together, they registered 133 pilots for the two-day event. That's quite a beginning! The Byron report focused on the factory's entries, which included two Huskies, a Cap 21 and a Beech Staggerwing, all mounted on floats. (I think the Byron factory is either producing or experimenting with these.)

Both days were windy, with gusts of up to 20mph. The Huskies flew well with sub-rudders mounted directly beneath the tail group, but had trouble with only a single water rudder. The Cap 21 performed flawlessly without an enlarged air rudder, but the Staggerwing needed a ventral fin because it lacked directional stability in turns. This might be a universal experience in float flying. A high-wing type of plane needs lots of air and water rudder to compensate for side area, and a mid-wing or low-wing plane (with lots of rudder to begin with, for aerobatics) can do quite well. Biplanes with typically narrower spans and larger areas will require additional directional control because the floats increase drag. Basics aside, congratulations to Tom Runge, the Ace Team, and the Higginsville Fliers for a super event in a super location. Make it run forever!

Dick Lemme, Jerry Sleight and Jerry's daughter, Tracy, enjoy assembling the three-piece wing on Jerry's scratch-built Newspaper Maru.



Kick-up rudder on Jerry Sleight's Maru uses friction-fit nut and bolt to allow movement with nylon support plate.

Schneider Race

This seems to be a month for reports, as I've also received the first issue of Bob Martin's Schneider Cup Event News*. The date of the first event has been confirmed for November 10, 11, and 12, 1989. It will be hosted by the Desert Hawks R/C Club and held at the Nautical Inn Beach on an island in the middle of Lake Havasu, AZ.

This event will generate a great deal of interest, and if you want to attend or enter this Schneider Race re-creation, you must get the newsletter. In this first letter, Bob states that "It doesn't take a genius to see this event has a lot going for it." It will almost certainly attract mainstream newspapers, radio and TV, and the models will be large (minimum wingspan 85 inches),

highly visible and will fly realistically at that scale. Model aviation will be honoring an event that brought incredible growth and made enormous contributions to aviation. The meet will be held near London Bridge, which was dismantled in England (the Brits permanently possess the Schneider Cup Trophy), and erected at Lake Havasu.

If you write to Bob, be sure to ask him for the *first* issue of the newsletter, as it contains the event's rules, sources of reference, a complete list of the eligible aircraft (which includes over 80 racers running from 1913 to 1931), and some final notes on current projects to date. Over 35 modelers from 11 states and Canada have announced their intention to enter, and a couple of European friends have also expressed interest.

The trickle-down benefits from this event will be incredible. There's already word of glass floats and cowls for the Supermarine S6-B, plans for other entries, and I'm sure half-kits and full kits aren't far behind. In marketing, there's reference to what's called the "third-wave phenomenon." This occurs in this way: Apple first makes computers in a garage, then Radio Shack and Sears start selling them, and, finally, IBM comes on the scene and makes the computer as common as VCRs and TVs. I really think that float flying has already reached its second wave in many respects. I couldn't be happier about that, and I applaud Bob Martin, Norm Goyer and the Desert Hawks for their contributions. This hobby, after all these years, just might get the respect and status it deserves.

Inexpensive Substitutes

A few years ago, I read an article about construction models from "found" materials. I can't remember the author's name, but constant building projects were just too expensive for his retirement budget. He solved his problem by building models from yardstick stock, scrap foam, cardboard, cheap veneers, etc., and his substitutes for otherwise expensive materials were nothing less than brilliant. Recently, a new member of our club, Jerry Sleight, showed up with "Newspaper Maru," a similar project which I present here.

Steve Milos prepares to launch Greg Ernst's Spitfire; YS .60 power with flaps.

Travis Coats holds Milton Dickey's ScatCat for run-up. Note solid shaft water-rudder hookup and wheel collars for gear-strut attitude adjustment.

Dave Schultz flips his ST90-powered EDO OSE-1 Warbird. The 10-pound scale ship is an awesome performer.

Jerry's reasons for building the Maru weren't economic. He challenged himself to construct an easily flown model that any beginner could duplicate, with economy as a side benefit. As it happened, the thrill of doing things differently was, in itself, a great reward. The fuselage consists of a door-skin mahogany box that holds the engine, tank, radio servos, etc., in one unit with scrap polystyrene slabs glued to the box and sanded to his liking. The empennage is foam-slab construction again, and the hinging is sewn strips of silk dress lining. The floats were shaped from blue foam slabs, sliced down the middle, and laminated back together with a six-ounce fiberglass web sandwiched between the two halves. Before glassing, scrap hardwood blocks were embedded in the float decks for hard points, and the landing gear is made of fiberglass arrow shafts with appropriately bent threaded rods epoxied into the arrow-shaft ends. Once assembled under the plane, the areas between the arrow-shaft "N" struts were glassed to form a flexible, yet sufficiently rigid, one-piece unit.

Jerry made one concession to modern technology by bringing the foam for his wings into the Skunkworks for Mike Johnson and me to hot-wire, but if a hot wire isn't available, you could sand a plug down to this "Jerry Y" airfoil with a little patience and a long sanding block.

In its original form, the wing was made in three sections with mahogany ply root ends and tube joiners. This was done to simplify flap linkage hookups and to make the wing easily transportable. But first flights proved that the flaps were unnecessary, and Jerry has since glued the

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AIRTRONICS

(Continued from page 90)

worked very well, and the model turned with almost no adverse yaw on aileron only. I then flipped on the aileron/rudder mixing switch and was really surprised by how smoothly the three-meter-span model turned. I appeared to have exactly the right amount of aileron/rudder mix on the first try.

On the landing approach, I set the flap switch for flap/elevator mix and got my first big surprise from this high-tech radio. To compensate for the flaps, I'd set the elevator for a lot more "down" than was needed, and the model went into a moderate dive, headed for "terror firma." I quickly got off the flaps and made a normal, albeit somewhat "hot," landing.

After adjustments had been made to the flap/elevator mix, I proceeded with the second launch, which was made using the preset flaps. With the automatic elevator compensation, the launch was very smooth and the model gained at least 50 feet over the first launch. I tried out the preset elevator trims and again found that what looked good on the bench wasn't right for flying. Both presets were too extreme, and I found myself first with a stalling model and then a diving model. When I had the elevator presets where I wanted them, I discovered another problem. The preset switch is very close to the dual-rate switch and can be inadvertently bumped. It's also longer than the dual-rate switch, which makes it easy to activate *accidentally* between flights. I've heard it said that all three positions should be "neutral" for safety. This might be a good idea until you become more familiar with the radio. On this flight, I hit some lift and took the model up to a good altitude. Control was positive at all times and I started to feel a little more comfortable with the radio.

On subsequent flights I finally started to get the various presets and mixers adjusted. This is a process that will take some time and should be approached patiently. I strongly suggest a little notebook for keeping track of the changes you make. Also, it's important to make one change at a time, and to make changes in small increments. The trimming process with this radio will take quite some time, but it's worth doing it right.

When you decide to try out the elevator/flap mix, do it with plenty of altitude. On the first attempt, I found that I'd overdone it again. It apparently takes very little flap to produce a quick change of direction during the turn. This is one mixer that will take a lot of adjusting to get just right.

As well as all the aforementioned capabilities, the 7SP is capable of spoileron mixing. On a model with separate ailerons and flaps, this gives you the ability to raise both ailerons to work as spoilers. When used with flaps, this allows for very steep, but slow, landing approaches. The 7SP could be used in a model like the Windsong and retain all of its mixing needs, but without all of the mechanical linkages.

It was now time for what I considered to be the most critical test of all! I waited until there were seven aircraft in the air and then I launched. Since I don't own any electronic test equipment, this seemed to be the best way to check for possible interference problems. Although we don't seem to have any 31M problems at our

field, I figured that with seven other radios on, if I was going to experience interference, it would happen now. There was no problem in the air and there were still a few models up as I made my final approach. I made the first leg of my descent downwind, almost directly above two of the fliers, and there was no interference at all. It's good to know that your radio is solid, even when there are several models in the air at once.

One other nice feature of the radio (but it has nothing to do with its performance) is the digital LCD timer. In one mode it's a 24-hour clock, great for letting you know when it's time to go home and cut the lawn. In the other mode, it's a stopwatch. However, unlike so many other radios with stopwatches, this one has two actuating buttons. It has the customary one on the front of the transmitter, and a second one on the upper left side of the case. In this position, it's possible to start and stop the watch without taking your eyes off your glider. This is great for timing those practice flights without tying up one of your flying buddies.

Conclusion

The Airtronics 7SP Module Series radio offers the sailplane enthusiast the most complete, purpose-designed radio-control unit available. It offers the most logical mixers and adjustments for sailplanes, unlike almost all other radios on the market, which are designed for powered aircraft. The 7SP is available from some sources for around $270 to $300. This is considerably less than the high-tech pattern-type radios that were the only other choice (if you wanted mixing capabilities) until now. My only real complaint concerns the instruction booklet. At times, it's rather vague and confusing. Airtronics does have a couple of additional sheets on the radio that they'll be happy to send out. These additional sheets were compiled by modelers using the radio and they're very helpful. Another important point is that the people at Airtronics are always ready to help. They *are* modelers, and they're capable of helping because they use the products they sell. The 7SP won't make you a world-class flier overnight, but it will definitely help you on your way to the winners' circle.

**Here is the address of the manufacturer featured in this article:*

Airtronics, Inc., 11 Autry, Irvine, CA 92718. ■

QUIET FLIGHT

(Continued from page 49)

This maintenance program will give electric fliers better overall performance and longer motor life. The only drawback with this procedure is that you have to do it regularly to maintain good bearing lubrication. I saw Carlos perform an abbreviated form of this maintenance procedure on a new motor. Afterwards, he put an amp meter on the motor, and this showed a lower amperage draw with higher rpm. If you fly competition, this could make the difference between winning and losing!

Project Wanderer

Last month, we modified the fuselage for extra strength. This month, we'll modify the tail group to make it lighter (and, consequently, less strong). The stock tail surfaces use what might be called "lumber," and can easily be made lighter, thus requiring less lead in the nose of the finished mode.

We'll retain the outline of the stab and use the elevators supplied with the kit. Replace the leading and trailing edges in the kit with 3/16x1/4-inch balsa. Cut new tips to follow the original outline extended to the new leading and trailing edges. The center sheet stays the same width but is extended to meet the leading and trailing edges. The straight 3/16-inch stab ribs are replaced with 1/8x3/16-inch pieces, and the new diagonal ribs are made of the same material. In place of the wire joiner designated for joining the stabs, we'll use a 3/16-inch dowel. Cut a piece of 4-inch-long dowel and line up the elevators with the trailing edge of the stab. Cut a notch in both elevators for the joiner and glue into place.

The vertical stab and rudder in the kit can be used, but the optional lightening holes should be considered *mandatory*. The vertical stab and the rudder can also be built up in the same manner as the horizontal stab. Follow the drawing of the example shown, and make the leading and trailing edges by laminating 1/16x3/16-inch balsa strips. This can easily be accomplished by outlining the plan with straight pins about 1/4-inch apart. Insert the 1/16-inch strips between the pins and glue with CA. Round the leading edges of both stabs, and give them a final sanding.

The tail group should now weigh about one third to one half of its original weight. This will save us from having to add weight to the nose and will give our Wanderer a slower glide and make it easier to handle. I'm sorry that I don't have pictures to accompany this section; I couldn't finish them in time to meet the deadline, so I'll include them next time, when we start the modifications to the wing.

Till next time...good thermals and a full charge!

**Here are the addresses of the manufacturers mentioned in this article:*

Cheetah Racing, 10823 Amestoy Ave., Granada Hills, CA 91344.

Revtech R/C Products, 7401 White Lane, #19, Bakersfield, CA 93309. ■

SPACEWALKER

(Continued from page 47)

mind. The *MAN* logo and call numbers were also applied using Cheveron paint with an airbrush.

Included in the kit are molded ABS parts consisting of dummy engine cylinders, cylinder shrouds, fuel-cap cover, compass and shock springs for the landing-gear spreader bar. These items dress-up the Spacewalker and care should be taken to install them correctly. I couldn't use the dummy engine cylinders or shrouds, because the Saito's engine cylinders took their place. I used the rest of the items, and they look just fine. The fuel-cap cover is functional and can be easily removed for fueling and defueling.

Since a compass was supplied, an instrument panel was obviously needed. A plywood instrument panel is supplied in the kit, with the gauges and covers from J-Tec*. The package contains enough gauges and covers to lay out a complete instrument panel, and they're 1/3 scale with 11/16-inch and 1-inch diameters. The keys are made of half a large metal quick-link and the screws are eyeglass screws. The turn-and-bank indicator was from a small level, and the convincing cockpit coaming and lacing was supplied in the kit.

PERFORMANCE: Well, the building is done, the finishing is completed and the cheesecake (detailing) has been added; I guess it's time to fly. With such a thick airfoil and a large wing coupled with 20 pounds, 3 ounces of weight, I didn't anticipate a problem. At the back of my mind echoed the words of our leader, Editor-in-Chief Rich Uravitch: "Screw this up, Abate, and you'll be flying dime-store gliders."

Well, no problem! With the Saito 2.70 swinging the Zinger* 18 x 8-14, I taxied out to the end of the runway. Roundhousing the stick to make sure all flight-control surfaces were OK, I started to apply power. At one-third power it rolled out straight down the runway. As with all tail-draggers, up-elevator is held and slowly released as you gain speed. Well, I was just about ready to go to neutral, when the Spacewalker lifted off the ground as pretty as you please. Standing next to me was my long-time friend and flying partner, Dave Rigotti, who commented, "Good God! It looks like a B-17 taking off." I made a nice, slow, shallow ascent (still at one-third power) to an altitude of about 200 feet, then made a large left-hand turn and leveled off. Quite an uneventful takeoff. After making a couple of large oval circuits, I decided to land to make sure all was OK, and landing was as easy as taking off had been—very responsive throughout.

After checking everything out, it was time to fuel up for a very enjoyable afternoon of flying. The Spacewalker will do all you ask it to do. It's very solid, authoritative and graceful—all Sig Manufacturing claims it to be. Hats off to Bruce Tharpe, designer of the 1/3-scale Spacewalker. Sig people boast that the Spacewalker is the largest model they manufacture. In this kit, I'd say they have a *lot* more to boast about than just size.

**Here are the addresses of the companies mentioned in this article:*

Sig Manufacturing Co., 401 S. Front St., Montezuma, IA 50171.

Saito; distributed by United Model Products, 301 Holbrook Dr., Wheeling, IL 60090.

Coverite, 420 Babylon Rd., Horsham, PA 19044.

Cheveron Hobby Products, P.O. Box 2480, Sandusky, OH 44870.

J'Tec, 164 School St., Daly City, CA 94014.

Zinger; distributed by J&Z Products, 25029 S. Vermont Ave., Harbor City, CA 90710. ■

SPORTY SCALE

(Continued from page 51)

Museum* in Dayton, OH, tell them that you'd like to purchase a set of the Federal Standard 595a colors, give them a credit-card number and you're in! Just dial (513) 255-3284, give your card number and presto, bango, zippo! In about four to six weeks (depending on whose moon is over Miami) you'll receive your very own six-volume set. For a mere $8.95, you can own a complete inventory of every color that's ever been used on *any* American aircraft.

So now you want to know what good Sammy's color chips are when the airplane you just modeled belonged to the Italian, German or Japanese air force? Well, thanks to a new magazine from England, you no longer have that problem: *Air Force International* lists the U.S. 595a equivalent numbers for various foreign colors. A lot of research has gone into this list, and it's about as close as you're going to come to accurate colors, unless you have some very old, out-of-print chips direct from some foreign country. We'll get into how to mix the colors some other time, but for now, I think we can safely say that the *elusive* color chip is a thing of the past.

Until next time, check your six.

**Here are the addresses that are pertinent to this article:*

Dave Platt Models, 6951 Northwest 15th Ave., Fort Lauderdale, FL 33309.

Monogram Models, 8601 Waukegan Rd., Morton Grove, IL 60053.

Wright-Patterson Air Force Museum, Dayton, OH, (513) 255-3284. ■

HELI CHALLENGE

(Continued from page 55)

fixed-radius support, which completely eliminates any chance of angling the swashplate. Other kits use a drag link attached to a ball on the swashplate at one end and to the mainframes at the other end. Take care to get the alignment of the swashplate square to the mainframes. Most of the instruction manuals I've seen skip right over this subject, so be on guard against this problem. This is a good way to check the swashplate alignment, using a square or a triangle with a 90-degree corner: Hold one edge of the square against the mainframes while the other edge is lined up directly under the ball link of the swashplate for the roll cyclic. If the alignment is correct, the ball link will be perfectly split by the square. Make the needed adjustments from here to bring the swashplate back into alignment.

Finally, be sure that there's no binding in the system when the controls are moved to full travel. Move the cyclic-control stick on the transmitter to full throw in all directions, and turn the rotor head by hand. Change the collective stick from full high to full low, and repeat the process. If you notice any binding as you turn the rotor head, you'll need to reduce the throw enough to prevent the bind. If you allow the linkages to bind the swashplate at full throw, a link could be thrown off, or a control lever could break in flight.

That should cover cyclic control. Now let's take a look at some trimming points that we've covered over the last few months, and wrap up our discussion on this subject.

Trimming Guide for Model Helicopters

Use this guide as a checklist when setting up and trimming a new machine, or going over one that's in need of troubleshooting. The list will highlight the steps and refer to the issue of *MAN* that covers particular problems in detail.

- On the bench, set up the machine to the closest known parameters. Be sure that you've checked all the linkages and controls to see that the movements are in the correct directions, and try to eliminate as much slop or binding as possible. If you've flown the machine already, try to keep a log of all the basic setups, e.g., pitch curve, throttle curve, etc.

Refer to the *MAN* issues November and December '87 and May, July, August, September, and October '88, and of course, this issue.

- Begin the basic flight tests. If this is a new machine, be sure that you take small steps and try to identify problems one by one. I usually begin by spinning the rotor head and checking the engine for proper fuel mixture as the throttle is advanced. If all seems well, when the machine is just ready to break ground, proceed to rotor tracking. Next, try to get an idea of the rotor speed and make adjustments to the hover pitch to bring the rotor speed into the ballpark. If everything is correct, the machine will be lifted into a hover. At this point, try to determine the state of the trim by the reaction of the controls. For instance, allow the helicopter to fly hands-off and adjust the tail-rotor pitch. Make adjustments to the trim levers on the transmitter while trying to get the helicopter to sit in one place. As you're making these adjustments, pay attention to the hover rotor speed and engine to be sure that all is well. Note that the gyro and ATS system are turned off, and the helicopter is being flown with as little assistance as possible.

Refer to the December '87 issue of *MAN* for details.

- When the basic trim is under control, start to work on the advanced flight trim. This is the process where we start to work toward a constant-speed rotor system. Begin by entering forward flight, checking out the normal flight characteristics and re-entering hover. Make a note of the performance of the helicopter through all of these flight phases. This is probably the most time-consuming and demanding stage, but the rewards make it very worthwhile. It's not uncommon for this trimming process to last several flights, and even several flying sessions. Stick with it, and take note of your progress.

Refer to the July, August, September and October '88 issues of *MAN* for details.

- When you have the machine flying well with a nearly constant-speed rotor system, it's time to recheck the basic trim and pay attention to the tail-rotor pitch. If the tail rotor can be flown hands-off in a hover, set up the anti-torque compensation system on your radio. Be sure that you do this with the gyro turned off, so that it doesn't hide any of the helicopter's undesirable tendencies. The ATS system will add an edge to your flying that

HELI CHALLENGE

actually aids the gyro's performance.

Refer to the January and March '88 issues of *MAN* for details.

• At this point, you'll have a helicopter that flies really well. As a final touch, you should return to your gyro installation and fine-tune it. There seems to be some controversy over the use of gyros. I think you should use the gyro to learn to control the tail rotor. As you become a more accomplished flier, challenge yourself to learn more and more. Don't let the gyro become a crutch; when you become more comfortable with flying, dial some of the sensitivity down, and just use the gyro to make your flying look more precise.

Refer to the May '88 issue of *MAN* for details.

That covers the major points of trimming fairly completely. I hope my long discussion of the subject has been of use to you.

Flight-Simulator Program

I've had several requests for more information on the flight-simulator program for the Atari ST computer from Ambrosia Microcomputer. David Sterns, president of the company, told me that the first shipment of transmitters is due in and should be available shortly. If you're interested in ordering this program, contact Ambrosia Microcomputer Products*.

Next month, I'll begin a discussion of flying basics, and I'll start a series on aerobatics and precision maneuvers. Until then, keep working on that ideal setup!

**You can contact Ambrosia Microcomputer Products at P.O. Box 1671, Hinsdale, IL 60521; (312) 655-0610.* ■

BUILDING PLANES

(Continued from page 60)

Because it can't be sanded away without damaging the surrounding wood, you'll have to shave it off with a sharp blade. Epoxy should be applied in *thin* coats and spread neatly on the surfaces that are to be joined. Any surplus that squeezes out of the assembled joint should be immediately wiped off with a paper towel (or a Q-Tip) saturated with lacquer thinner.

• *Cyanoacrylates* (CAs) have revolutionized model-building techniques. Their instant-curing ability has dramatically shortened construction time, and their strength rivals that of epoxy. However, they, too, have a few disadvantages.

The shelf life of CA is limited, particularly in hot, humid weather. A few years ago, I put a couple of bottles in my field kit before driving from my home in western Pennsylvania to a contest in California. When I unpacked at the field, both bottles of CA had solidified. Another problem I've encountered is that large CA bottles split and leak glue over everything nearby. This has happened to me several times, but only with the large containers. I now only buy one-ounce or smaller bottles. Unopened, CAs will keep indefinitely in a freezer, but putting a partly used bottle in the refrigerator is more likely to *shorten* its life than to lengthen it.

CA comes in three degrees of viscosity (or flow-ability). The thinnest kind produces the strongest model-airplane joints, even though all three grades cure into chemically and physically identical acrylic plastic. Cured CA is far stronger than balsa or lite-ply, and when a CA-glued joint fails, it's the wood that fractures, not the cement. Thin CA penetrates farther into wood than thicker, gap-filling types, and thus provides a deeper, stronger anchorage by toughening the wood surrounding the juncture.

Thin CA seeps into joints and the wood around them by capillary action, but because it's so thin and flows so readily, it's easy to apply too much. It's particularly irksome to construct a wing over a wax-papered plan on the building board, only to find you've put so much CA into the joints that it's glued the wax paper to the wing's entire lower surface.

To avoid this sort of fiasco, I've been using a two-step technique for built-over-the-plans model construction. When I first assemble a structure on the building board, I apply just a tiny drop of thin CA at the top of each juncture. Then, when everything is together, I carefully remove the component from the board, and add enough thin CA around each joint to ensure a complete bond.

The thicker grades of CA should be used like conventional glues: A thin coat should be applied to mating surfaces just before joining them. Since thick CA cures more slowly, you'll have more time to move parts into exact alignment before the glue cures.

• *Polyvinyl-type adhesives* (or white glue) come in a variety of types and brands. The best white glue I've ever found for modeling is Sig's Super Weld. It sets up quickly, is incredibly strong, and it never loses its flexibility.

Flexibility is important in adhesives used for models that experience high stress or vibration. That's why I don't use the aliphatic resin-type of white glue, such as Franklin's Tite Bond. (This is the "sandable" version of white glue.) Aliphatic resin cements are made to dry out hard, so the abrasive grains of sandpaper can chip particles off during sanding, but this makes the cured glue far too brittle for my models.

To see what I mean, spread a small puddle of aliphatic resin on a piece of wax paper and let it dry for a few days. Then try to bend it; the dried glue is less flexible than a potato chip. If you try the same thing with Sig's Super Weld, the cured glue remains flexible enough to bend double, even after months of drying time.

Because brittleness is too high a price to pay for "sandability," I use white glue carefully and avoid getting it in places where it will have to be sanded off. I apply it sparingly with a fairly stiff-bristled watercolor brush, which lets me "squeegee" the glue into the wood fibers for the best possible bond.

White glue is water-thinned adhesive, so has a few quirks. Water makes wood expand, so if you spread white glue on one side of a piece of sheet balsa, in a minute or so, the glued surface becomes a convex curve. To avoid this, dampen the opposite side of the wood before applying the adhesive. Another peculiarity of white glue is that it remains water-soluble forever: Don't use it on a seaplane! However, white glue is great for joining foam. Unlike epoxy (the only other suitable cement for foam model parts), excess glue can easily be removed, even when it's dry.

A special version of white glue for bonding non-porous materials like plastic is available under various brand names: One is Wilhold's R/C-56, which is great stuff for attaching windshields and bubble canopies. I use it a lot.

• There's still a place for the old-style *model airplane glue* in today's modeling techniques. This was *the* cement in the good old days, and was sold everywhere. Today, the most available type is Duco cement. It's quick-drying, flexible, strong, waterproof and easy to remove by sanding or by using a solvent. The main flaw is its lack of fuel-resistance, but for gliders and electric-powered models, Duco is great stuff.

Preparation

Here are some tips about glue-joint preparation: We routinely clean off dust from our model parts before painting or covering, and the same should be done before cementing. For the best possible bond, adhesives should be applied to clean, dust-free material on both sides of the joint. As for the actual thickness of the glue in the juncture, recent tests at Virgina Polytechnic Institute and State University have shown that glue joints are strongest when the gap between pieces is from .002 to .007 inches. This means that very tightly fit joints are not as strong as those where a thin continuous film of glue holds the parts together. A gap of .002 inch is about the thickness of a page in this magazine, while .007 inch is the thickness of a page plus the cover. That should give you a good idea of how much clearance to allow in your glued joints for maximum strength. Don't use tightly squeezed fits if you can avoid them. They'll force needed adhesive out of the joint and produce a weakened bond that may fail at a highly inopportune moment.

Stick with it!

**Here are the names of the companies mentioned in this article:*

Hobby Poxy Products, 36 Pine St., Rockaway, NJ 07866.

Sig Manufacturing Co., 401 S. Front St., Montezuma, IA 50171. ■

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ailerons. Using one of the tones, e.g., 1800cps, the necessary proportional action was created by establishing 1800cps as the neutral. Then this was varied from 1800cps to 1700cps with a continuous proportional change. With full transmitter up-stick deflection, 1700cps was reached, as was 1900cps for down-stick full deflection. Right and left stick varied the 3700cps tone similarly. As the transmitter stick varied the tones, the system provided control-surface deflections that reflected the stick changes. True propo action!

These tone changes were precisely detected by the receiver discriminators, which passed the info on to the voltage amplifiers, and these responded in like manner, passing on to the servos a voltage change that corresponded to the degree of stick movement. The discriminators were the heart of the Space Control super-het receiver. From the space industry, our story corporation brought miniature, adjustable toroid coils that could be accurately tuned to the transmitted tones. So the two fundamental controls were the only parts of the S.C. system that used the analog principle.

For rudder and engine controls, S.C. took some pages from Walt Good's book. Walt and friends had developed variable pulse rate and width as viable methods for propo control. These were much simpler circuits with "fixed" components—no complex tuning or adjusting required.

The rudder circuit *was* pulse rate; to produce propo action they varied the number of times per second the basic analog tones were transmitted. This resembled the method used with the analog tones; there was a "neutral speed." By slowing down and increasing timing from the neutral speed, right and left rudder

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control was achieved.

For *engine* control the *spacing* between the two audio tones was varied. Unlike the other controls, there was no neutral. The widest obtainable spacing represented high engine; minimum spacing gave low engine. Thus, engine speed was variable from low to high.

I hope you see that the rudder and engine of Space Control were, in principle, Walt Good's TTPW concept. By using transistors and feedback servos, the ultimate TTPW was developed, and as such, it was extremely reliable. With fixed circuitry, this portion was much simpler than the analog section.

This was the proportional idea that engineers developed. Naturally, the transmitter that was to convey the needed information also had to be complex, and with the use of the new-fangled transistors and military-spec components, a reliable output was achieved. The transmitter was stable, and this stability was greatly aided by the use of Ni-Cd batteries.

There's much more to the Space Control story, and I'll continue it next time, turning now to more current happenings.

Positive Feedback

What's happening with regard to the OT R/C organization I suggested in the April '88 issue? In short: Responses to the idea were numerous and *positive*, so it seems that such an organization is viable. We must decide how to start, remembering that everything should be done properly from the very beginning. First, there should be a moderator—someone who can act as a "headquarters" until a membership can be established. I've asked the AMA for advice and I'm now just waiting for that before proceeding. I'm working on it, and any help or suggestions will be appreciated! *Editor's note: Hal prepared this column before plans had solidified on a "moderator." Our old friend Joe Beshar has "raised his hand." See details in "Vintage R/C Organization" elsewhere in this issue.*

Allan Walker, who heads the British version of an OT R/C organization, recently checked in. He offers more help with our continuing search for OT R/C plans. I now have his extensive list of plans that are available in England, so if you have a particular need, contact me. Our English friends may have what you want so badly.

When I ask, you people usually come through to meet the need. I received a nice note from Dan Lutz of Fallbrook, CA, in response to the request for Stormer plans. It's always good to know that modeling pioneers appreciate and enjoy what we are all doing. Many OTers will recognize Dan Lutz and his long-time contributions to modeling; Dan is an extraordinary modeler—a meticulous craftsman. As well as making beautiful models, Dan worked with Phil Kraft for over 15 years and could always be relied upon to give your needs his closest attention.

Dan says he thoroughly enjoyed our recent discussion about some of the Kraft doings. For my part, I hope that there's someone who can give us more facts about Kraft. Phil and Kraft Systems were such a major part of R/C for so many years, that it's a shame we're so lacking in pertinent info. I'd love to go into more detail.

Unfortunately, a few years ago, Dan Lutz was involved in a serious accident and now gets around in a wheelchair. It's just great to know that he's returned to

modeling with his outstanding ability intact. For you plan-seekers, Dan says that John Pond* has a most *extensive* offering, including *most* OT R/C planes.

Seventy-one-year-old Arthur May, of Bismark, ND, also checked in, recalling some of our past Nats meetings. Art was a pattern judge at the '68 Nats and is still active. Best of all, he enclosed some photos from the 1948 Plymouth Internats at Detroit. Although C/L oriented, that Plymouth program did so much to promote modeling! In '48, R/C had yet to come alive; there were only a few involved, and success was often just momentary. This was the time of Jim Walker—*our* John Ringling of modeling. Jim was a *showman* who seemed to be on an eternal trek to promote our hobby. Art tells of his association with Jim at that Plymouth meet. Jim traveled alone and thus needed a helper. Part of "Jim's show" was to demonstrate R/C for C/Lers. As the picture shows, Jim had his usual giant R/C model, which required hand-launching, and apparently Art met that need well. At that time, Jim's "thing" was to climb sky-high and enter a cloud. He would then predict where the plane would come spinning out. Not sensational now? You'd better believe it was hair-raising *then*. Most amazing was his positive control, which *always* resulted in perfect landings. Active C/L modelers were overwhelmed by Walker's R/C display. Such demonstrations were the beginning of the R/C explosion that was to follow!

**You can write to John Pond at 253 N. 4th St., Box 90310, San Jose, CA 95109.* ■

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mounts for the transmissions and must be cut from provided stock. Pay careful attention to hole placement so that when you mount the transmissions later, they'll line up with the holes molded into their cases. Here, I cheated by drilling all holes in the wooden parts slightly oversize. Placement of the 45-degree transmission is clearly marked on the fuselage boom, and those holes should also be opened as accurately as possible. Assembly of the 45-degree transmission (provided with the fuse kit) should be done at this stage, as it's needed for further alignment. Mount it loosely in the fuse along with its ply side-reinforcement plates, sanding as needed so that all fit with a little play. Assemble the tail transmission-tube mount with appropriate formers and glue it into the formed flares at the fin tip. When the glue has set, slip the provided short drive wire into the 45-degree transmission through the fin tube. Wedge or block it so that it's centered, then epoxy or CA the 45-degree transmission side formers onto the fuselage. When the glue has cured, tighten the mounting bolts only until snug. Pull the wedge out; the wire should stay close to the center. Slight position changes can be made by alternately tightening the mounting bolts. Just make them snug, not tight.

The other end of the 45-degree transmission is a lot easier, as the former just ahead of it has a larger hole for the drive-wire guide. Epoxy that guide tube to the middle former only, leaving both ends loose until the final mechanical assembly. The supplied nyrod pushrod is positioned through the former holes and glued into place.

A piece of airfoil-shaped hardwood is attached through the stabilizer slot cut earlier. Vertical fins are cut and shaped from balsa and glued to the stabilizer ends. These pieces are best sealed with resin, CA or your favorite method before this stage, as they'll be difficult to sand when they're mounted. Lastly, cap the end of the main fin with balsa, sand it to shape and then seal.

Put the fuselage on a flat surface, add weight inside and attach the front cabin. Using resin or polyester-compatible epoxy, align and attach the tail boom. Tape and prop this in place until it's cured. Turn out the lights and call it a day.

The fuselage is now ready for final sanding, pin-hole filling (if any), primer and the paint of your choice. Be sure to use compatible elements when going through the finish/paint process. Stick with a single product line from base fillers to finish coats. The paint job took approximately eight hours, including all masking, color and decal application, airbrushed Robbe logo and final clear sealant. This is a pleasure when proper and compatible materials are used.

While the fuselage was curing, work began on the mechanics. Since the basic Champion mechanics are used, I'll outline only the steps and components that are pertinent to the BK design.

Power to the tail rotor is supplied through the previously mentioned 45-degree transmission that mounts on the tail-boom bottom. A molded glass/nylon case holds both input and output at the proper angle to transfer motion up the tail

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fin. Both shafts are mounted in two ball bearings, each with a bevel gear at one end. The setscrew that locks the gear to the shaft also passes through half of the shaft's diameter to engage the drive-wire flat inside. This is pretty standard on Schluter machines, so it shouldn't seem unusual. Bolting the halves together captures both the shafts and the tail-skid wire. Placement in the tail-boom bottom with four attaching bolts totally seals the transmission grease bath from outside elements.

A parts bag provided with the fuselage kit includes a new servo-mounting system, which is actually a parts inventory right out of the newest Scout 60 and Junior kits. Control movements to four blades must be kept precise and uncomplicated, so sliding the swashplate on the main rotor shaft reduces the parts count. Plastic tabs with a molded pivot are attached to your servos using the radio's mounting hardware. Two rails, each with three pivot points, are mounted to the top woodwork shelf. Servo-spacing is automatic and provides a friction-free and slop-free system for rocking all three servos in unison. Molded output arms must be attached to arms on your servos, with brass ball outputs spaced for your control preference. The given dimensions were followed and these allowed full servo travel without binding. A connecting bar with three ball sockets is snapped onto the center balls to tie everything together. Pushrod stock, pre-threaded and of the correct length, is provided and assembled (with ball links at both ends) to the specified center-to-center dimensions. Two new bellcranks are attached to the Champion's side frames; one replaces the unused collective slider, the other reverses a ball link inward. This change places bellcranks and ball links into a four-point swashplate suspension setup. Attaching the previously assembled pushrods links it all together. The final rod runs from the collective servo to a ball attached to the inside front side frame. Operation of the collective servo now rocks all three servos fore and aft, raising and lowering the swashplate. Independent action of the cyclic servos allows roll, pitch and collective to be activated simultaneously.

Throttle and tail-rotor servos are independently mounted on the bottom and top trays, respectively. Cutouts can be made in the center support for gyro mounting, and there's plenty of room for large battery packs, switches and foam mounts for the receiver. Though different in appearance from a standard Champion, the assembly of the wood takes no more time to complete.

Taking advantage of the easy access, all servo-to-swashplate connections are adjusted at this time. With all servos at neutral, adjust the ball links so that the swashplate is level or perpendicular to the main shaft. Initial cyclic pitch and roll throws call for 4 degrees each way or 3mm rod travel in each direction from neutral. Using the servo-ball spacing shown on the plans results in more than this, and will be needed later. Set the recommended throws on the low-rate side of the radio for initial flights. Collective travel is approximately 6mm minimum, low to high, measured at any servo-output ball. Set for more travel now, as it will be fine-tuned during final set-up.

The focal point of the BK-117 is the four-blade rotor head, as it completes the scale appearance and generates more questions than any other feature of the model. Though complex in appearance, it's really a simple piece of modular engineering. Blade holders, pitch arms, stub shafts, thrust and support bearings, dampeners and attach bolts are right out of Champion's parts bin. Additional modules include a mounting tube that bolts to the last piece, which is a four-sided hub. This configuration allows as many blade assemblies to be attached as there are sides on the hub. A three-blade head, constructed of the same blade module pieces, is used on the sister ship, Twin-Star. Individual blade dampening is provided via the blade-mount stub shaft, which fits through several dampening O-rings inside the hub-mounting tube. A horizontal cross-bolt through the tube becomes both anchor and pivot to the shaft and blade mount. An exploded-view drawing details the parts breakout for both heads and gives the builder a working knowledge of all components—useful if repairs are needed. The rotor head comes preassembled and completion requires only the attachment of pitch arm balls. Plastic ball links are fitted to both ends of four rods of a prescribed length and placed to one side until final attachment of the head for linkage set-up.

Rotor blades for this system are of traditional hardwood leading-edge balsa trailing-edge construction, with one major variation. Shorter and narrower than the standard Champion's, these blades have a full-length leading-edge slot milled to accept a piece of 3mm piano wire. Even in two-blade systems, weight is necessary in each blade when

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the familiar flybar is absent. Gyroscopic stability provided by the weight from flybar paddles must be replaced somewhere in the rotating mass, so weight is added to compensate. Likewise, the blades won't track or fly properly if gyroscopic dampening is absent. Heavier blades create their own stabilizing and dampening forces. Weighing of the blades wasn't possible, as I don't have sufficiently accurate scales. However, while working the blades on Schluter's blade balancer, I estimated that each weighed approximately one-and-a-half times a stock Champion blade. Since stock blades usually average 130 to 140 grams, these weigh over 200 grams each.

All other Champion pieces are bone stock and assemble in the Schluter tradition—easily. A Schluter/Webra .61 was installed along with the extra-quiet Robbe tubular muffler and Perry's* P-30 pressure pump. Completed sub-assemblies consisting of main chassis, landing gear, tail-rotor gearbox, rotor head, blades and finished fuselage now sat on the workbench, ready for the moment of truth. Would it all go together without a mallet and crowbar?

Final assembly began with placement of the tail-rotor transmission. The short shaft coming up the fin was already in place and slid into the tail-rotor input shaft with just a slight sideways push. Seating and securing the transmission with the supplied clamp locked it into the proper position. Aligning the drive wire flat under the setscrew was accomplished by the wiggle-and-feel method and then it was tightened. Turning the output shaft by hand confirmed that the alignment from the angled transmission to the rotor transmission was free and without binds. From the front, the long drive shaft, heavily greased, was inserted into the plastic sleeve that had been previously epoxied into the main-and tail-boom formers. The end near the 45-degree transmission, which passes through another former and wasn't yet fastened, allowed the drive wire to be nudged into alignment with the input shaft. Once in and the setscrew tightened, epoxy was added to anchor the drive tube. Lastly, while rotating the tail output shaft, the bevel transmission bolts were snug-fitted. These turned smoothly with only a little resistance at one point in the revolution. I decided to leave the alignment "as is" until some running time could be given to the drive system.

Installing the main chassis required ample time and the ability to work freely from both sides of the fuselage. Arrange your work area so that this can be accomplished. The assembled landing gear is first mounted by attaching the front bolts from inside the cabin area. With Champion mechanics, the back mounting bolts attach the chassis through the fuel tank cross-brace, so they must be installed later. Plan on several insertions and removals of the chassis during this step, as one attach point must be drilled and the muffler-spout opening cut out of the fuse bottom. This step is made easier by removing the several bolts holding the radio woodwork to the frames, detaching all pushrods and removing the entire front assembly.

The cavernous opening of the main fuselage allows plenty of room to move the mechanics around. Slip the chassis into the opening and seat it slightly ahead of its true position. With a long rod or a screwdriver, lift the drooping tail-rotor drive shaft into position and mate the coupler with the main drive output shaft. Push the chassis into place by aligning the landing-gear mounting holes and the front, bottom, main-frame hole. By dropping the bolts through, you hold the proper position while the muffler-spout exit hole can be marked. At the same time, a measurement is taken from the rear edge of the main rotor shaft to the edge of the top fuselage opening. This is used as a reference point for placement of the rear bracket mounting hole.

Remove the chassis from the fuse and cut the muffler exhaust hole in the fuse bottom, leaving at least ¼ inch clearance all around. The rear chassis support bracket and post is marked and drilled according to the mechanics used. The position and angle for mounting are taken directly from plan drawings and it fits perfectly. A pre-bent tab for capturing the nylon control rod is mounted with the same bolts as the post bracket. Measure from the rear of the main rotor shaft to the post center, subtract the earlier measurement, and mark the remaining dimension mark on the fuse top center line aft of the shaft opening. A 3mm hole is drilled and backed from the inside with a 3mm-thick piece of plywood to form an anchor spot for the chassis back side.

Re-mount the servo to the bellcrank pushrods and make a final check of fuel lines; tighten frame bolts, etc., as some of these areas get a little loose once the

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chassis is attached to the shell. Slip the whole assembly back into the fuse, mate the drive wire, slip the nyrod under the tab loop and ease into place by aligning the bottom mounting holes. Attach all bolts to the bottom and tighten them. If measured twice and drilled once, the anchor post lines up with the top fuse hole so that a long attach bolt drops right into the post's threaded hole. Position the radio woodwork between the frames and reattach. Snap all pushrod ends onto their respective servos. Hook up the throttle servo on the bottom shelf, put a coupler on the tail-rotor nyrod and connect to the servo. Mix a little epoxy and, using a long applicator, apply it to the joint of the tail-rotor drive-shaft housing where it passes through the former. Now check and tighten all bolts and you're done!

The four-blade head is slipped onto the main rotor shaft and secured with one M3 bolt and locknut. Four pushrods of equal length are connected to the blade-pitch arms and servo-output balls. At this step, a large work area is needed, as blade attaching and pitch settings are made. Dial low- and high-pitch end trimmers on the transmitter to maximum throw, and set all sticks and trims to neutral. Mount a pitch gauge to one blade and turn the radio on to set the neutral point of the servos. Turn the radio off and set each blade at 3½ degrees positive. Check each blade several times to confirm that all blades have the same pitch setting. Also, set the throttle linkage so that the carburetor is five-eighths open, and set the tail-rotor pushrod length so that the aft bellcrank is at the center of its travel range. Move the tail-rotor pitch-change collars so that the blades have approximately 10 degrees of positive pitch. Change the pitch gauge to 7½ degrees positive and remount on a blade. Turn the radio on and go to maximum pitch on the throttle stick. Dial the high-end trimmer until the gauge stabilizes at 7½ degrees. Reset the gauge to -4 degrees, move the throttle/collective to the low position and dial until this setting stabilizes. These settings are recommended in the plans and proved to be dead on. Install the front cabin onto the fuselage and check the CG of the machine. If all was done right, it will dip slightly, nose-down, when lifted at the head-mounting bolt.

Did all components go into the fuselage as advertised? Darned close. If I hadn't fudged by making most of the mounting holes slightly oversize, it would have been very tight in some places. All the holes are easily accessible, so enlarging them as you go wouldn't be a problem.

OK, OK... Let's go flying!

PERFORMANCE: My Webra* engines have always been trouble-free and this one was no exception. Easily started and adjusted for idle, the continual purr allowed time to confidently perform slow run-up of the rotor system. Balancing two blades can tax your patience, so having *four* to match leaves you wondering if you've done it correctly. Slow run-ups allowed the engine some loosening time and allowed the blade grips, bearings, drive train and nerves to settle. Watching and listening to four heavy blades wind up to 1300 to 1400rpm soon becomes as routine as handling a two-blade system, especially when the balance is right on and the rotor system rotates smoothly.

By the second tank of fuel, it was time to commit to flight! A little leaning of the needle valve, run up to almost half throttle, a nudge more and a smooth liftoff into hover was executed. Right tail-rotor trim was added to steady the nose, and a touch of left-roll cyclic trim put things into place. The BK-117 sat solidly in a two-foot hover, requiring only slight stick movements for corrective inputs. Blade tracking required only half a turn of the clevis on two blades to bring all four into a perfect line. The rest of the fuel was consumed while getting the feel of this new machine by performing close hovering figure-eights.

Schluter's flight instructions for the four-blade system outline how the model will feel in flight. It states that a difference in control "feel" will be pronounced, and cautions against flying a standard flybar machine and the multi-head model during the same flying sessions—at least until you have experience with both. My first fly around confirmed the validity of this advice, as I was thinking and automatically flying flybar system. Because of this, those few circuits were of the Oh!, AAHHH... Whoa! variety.

While *hovering*, the control reaction differences of the two systems is hardly noticeable. This is due to minute inputs to maintain control, and this needed less with the four blades, since it's extremely stable. When flying *forward*, larger control movements are used, and the difference immediately becomes apparent. On a flybar system, the flybar is a control gyro that always tracks perpendicular to the main-rotor shaft when in a neutral state. The main-rotor disc always tries to remain parallel to the flybar position and will follow its tilt due to the linkage

connection between them. Any cyclic control input will execute tilting action of the main-rotor disc that immediately stops and holds a given attitude as soon as the control stick is returned to neutral. Tilting momentum in the rotor disc is dampened or cancelled out by the flybar when they reach a parallel state.

Since the four-blade system is sans flybar, it has no device to cancel the rotor disc's tilting momentum. For example, a roll cyclic input will initiate roll-tilting action of the rotor disc. Returning the control stick to neutral won't stop the roll action, since the tilting momentum has no cancelling device. Opposite roll cyclic must be applied to stop the rotor tilt before the stick can be safely neutralized. Initial flights induce a fear that a servo has failed right after the last command was given, and this causes you to overcompensate. It takes thought and careful progress to feel the machine out, and if you practice in graduated steps from hover to ever-enlarging eights or fly-arounds, you will be very comfortable by the eighth to tenth flight.

Fuel gallon three found the BK-117 moving through some pretty aggressive turns and speedy forward flight. As my confidence increased, so did control throws. The initial set-up throws are about right for learning the BK since over control is commonplace, but once the hovering and slow flight are comfortable, more is needed to keep from running out of control. Faster forward flight exhibits a pronounced desire to pitch up and requires half-forward stick to maintain level flight. This characteristic is described in the instructions so it doesn't come as a surprise.

The large rotating mass of rotor blades presents a new set of flying rules, not only for control, as I just described, but in the lift and power requirement department. Four healthy-size blades put a lot of surface area in contact with the atmosphere. When this occurs, two elements of aerodynamics become apparent: increased lift and drag. Additional lift is most noticeable in forward flight, even at very low ground speed. The BK-117 cruises briskly, maintaining altitude at roughly one-third collective. A pitch-gauge ground check with the collective stick at that position showed the machine using about one-degree positive. Descents from altitude with moderate forward speed require full down collective or all of the pre-set -4 degrees.

Drag is as noticeably negative as the additional lift is positive. Not only does the increased area of the four blades contribute its portion of parasitic drag, but the rotating weighted mass also creates more torque, which requires tail-rotor compensation. Additional pitch, 4 degrees more than Champion's usual of 8 degrees, brings the tail-rotor pitch to 12 power-robbing degrees. The optional longer tail-rotor blades were tested, and they reduced the pitch burden to roughly 10 degrees with noticeable improvement. The additional angled tail-rotor transmission also contributes to power requirements by generating some gear/bearing drag. The overall flying weight of 12 pounds adds some burden but isn't considered a major contributing factor. A slightly lighter, two-blade Superior/BK-117 combination flown locally last year performed nearly as well as the stock Superior. Great power is required to operate the four-blade system and this must be taken into account during engine selection.

The total of this high-lift/high-drag combination presents an interesting flying problem. Moderate-to-fast forward flight is fairly effortless with ample power reserve, yet hovering maneuvers stretch the limits of available power. At no time does the BK-117 feel unstable or uncomfortable in flight, but it must be caressed through some flight maneuvers that require heavy applications of reserve power.

The BK-117 has used approximately eight gallons of fuel without a problem. The slight bind in the tail-drive system is gone and it now turns smoothly. No cracks or deformities have appeared in the fuselage, and the ship remains very clean inside and out. The large removable cabin allows easy inspection of critical components and ample room to make repairs.

The BK-117 kit is one of high quality materials, construction, and finish—and it looks beautiful! The four-blade rotor system is an uncomplicated piece of engineering that gives scale appearance and operation without full-scale maintenance. The ship is easy to set up and maintain, and it should provide many hours of trouble-free flying.

Flying is pure pleasure as the control system is responsive through the entire performance range. The different "thought process" needed to fly the four-blade head is easily mastered as this machine is stable and docile in the hover, yet can be aggressive in forward flight. Power requirements are higher than in two-blade helicopters to achieve equal flight performance. Scale-like flight with occa-

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sional high G maneuvers can be handled by any good .61 engine. Those opting for higher performance or more power reserve should go for .75 to .90s.

Robbe/Schluter must be commended for producing an after-market scale fuselage that retrofits so easily. It allows the modelers to fly their current (and possibly only) machines right up to the final assembly stage. Although varied skill levels could lead to some frustration while building the BK-117, the accuracy applied during the manufacture of this kit will minimize such problems and allow any R/C helicopter modeler to enter the world of scale flying.

**Here are the addresses of the manufacturers mentioned in this article:*

Robbe Model Sport, 180 Township Line Rd., Belle Mead, NJ 08502.

Perry Aeromotive Inc., 1566 Osage Ln., San Marcos, CA 92069.

Webra; distributed by United Model Products, 301 Holbrook Dr., Wheeling, IL 60090. ■

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applied at this time. The elevator halves are then joined, using a wire joiner that's held in place by plastic retainers screwed to both halves. The control horns are mounted to the elevator and rudder. (The elevator is pre-hinged with tape, top and bottom.) The rudder is built with two, long, threaded wires that protrude from the bottom and are inserted through two holes in the top rear of the fuselage. These are "captured" by two nylon caps on the bottom of the fuselage, so securing the rudder in place.

The wings are joined using a clever, tiered, balsa dihedral brace that's doubled with plywood. Following the measurements provided in the construction booklet, an opening is cut in the center of the wing for the aileron servo. As the wings are joined, the wing hold-down dowel is epoxied into a slot between the two center ribs. The trailing-edge pieces, which hold the aileron torque rods in place, are then glued to the wing. These pieces are slotted to accept the torque rods, which are capped with plastic sheet to hold them securely in place. The torque rods are attached to the ailerons with nylon retainers. The aileron horns are screwed onto the torque rods, and exact measurements are given to determine their positions. The plywood plate for mounting the aileron servo is glued in the previously cut opening in the center of the wing. The

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plate is glued to one side of center, and at an angle created by the center ribs. This gives enough clearance for the aileron pushrods. The tips are glued on with CA, and the wing is decorated with the supplied graphics.

The servo tray for the rudder and elevator is *screwed* to the canopy opening lip as glue won't stick to the plastic fuselage. The servos are then mounted, inverted, in the tray, near the trailing edge of the wing opening. The supplied pushrods for the rudder and elevator are hooked up to the servos and the control surfaces. These are of exactly the right length, and even have Z-bends for mounting to the servo arms.

The speed controller is servo-taped to the side of the fuselage in the "tank area" along with the receiver and radio battery (250mAh).

The motor unit and gearbox are attached to the motor mount with rubber bands. This is sufficiently secure, but still allows the motor to move in the event of a less-than-perfect landing. Wires with spade lugs are supplied for motor-to-speed controller hook-up. This is the only place where I deviated from the construction booklet. I soldered No. 16-gauge high-temp wire directly to the motor and used Anderson Power Pole connectors at the speed controller and batteries. These connectors and the high-temp wire give better performance as their resistance is lower than that experienced with the stock materials.

The plastic battery box fits into the canopy opening and is held in with four screws; the batteries are secured with a rubber band; the canopy is trimmed, and Velcro strips are attached to it and to the fuselage sides. This allows it to be easily removed for quick access to the flight pack for charging.

The air scoop in the bottom of the cowl is then cut out and the cowl is attached to the fuselage with three screws. The propeller and snap-lock spinner are mounted.

The wing hold-down block (made of two layers of ⅛-inch plywood) is attached to the fuselage with two nylon end-caps that trap it, and are then screwed to the fuselage sides. The block has two nylon inserts that are screwed to it, and these accept the wing hold-down screws. The aileron servo is mounted with the supplied servo tape, and the aileron pushrods are attached to the torque rods. A plywood backing plate is glued to the trailing edge of the wing where the wing hold-down screws pass through it.

Ready to fly, my Flash weighed 45.5 ounces and had a wing loading of 18.8 ounces per square foot. I chose to use an 8.4V 900mAh battery, and my radio is a Cirrus PCM 5-channel with three S-133 servos, a 250mAh battery and Panda MOSFET speed control.

PERFORMANCE: All surfaces were checked for proper direction, and the balance was also checked. The model was nose-heavy, so I had to move the receiver back to the rear of the battery compartment where I mounted it with tape to the flight battery. Everything else checked out, and it was time to prove—or disprove—the advertiser's claims.

I usually fly my electric models at the Harbor Soaring Society's glider field, but this time, I wanted to try an ROG takeoff, and so I headed for Mile Square Park. This park is one of the best-known power fields in Southern California, and it has a beautiful blacktop runway.

The Flash is a tail dragger, but it doesn't have a steerable tail wheel. It was apparently meant for hand-launches, although the ads claim it has the power for ROG takeoffs. I attempted to ROG, but was unsuccessful; I couldn't keep the model from ground-looping when I applied power. I then found the model's only weakness: the landing gear. When the Flash ground-looped, the gear rolled under because it's relatively soft and springy.

A crosswind encouraged me to give up the idea of ROGing the Flash, and I decided to hand-launch it. It was now time for the Flash to live up to its advertising hype. I opened the throttle to full, gripped the plane behind the wing, and gave it a good shove into the wind. It flew away in a right bank that was easily corrected with a slight touch of aileron. The climb-out was very smooth and swift. I spent the first flight just testing the model, using a 7-cell 900mAh battery pack that was good for about 2½ minutes at full throttle. The Flash felt solid and was very responsive. When the battery

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FLASH EP

(Continued from page 112)

power was low, I set up for final. The model is very controllable when dead stick and has a relatively good, albeit fast, glide. Towards the end of the roll-out, the model turned into the crosswind and again rolled the gear under.

After straightening the gear and recharging the batteries, I was ready for the second flight and the opportunity to see if the Flash was really capable of "pattern performance."

Since the Flash is a low-wing plane, it's somewhat difficult to hand-launch, and care should be taken to make sure the wings are level at release. The second launch was smoother than the first, and the Flash was off again. As I made my first downwind leg, I rolled the Flash over and, inverted, made a complete circuit of the field. As I came back into the wind, I executed three consecutive (somewhat sloppy) rolls, and then went straight into a split-S. At the far end of the field I did an Immelman, came back into the wind, did a stall turn and then set up for final. The second flight ended better than the first, and the gear was only slightly bent!

Well, it looks as though the Flash *does* live up to the advertising claims made by Great Planes Distributor, and it's definitely capable of "pattern performance" if not "pattern-like speed." The Flash adds a new dimension to the electric flight scene with performance that far exceeds that of any other electric-powered ARF, and probably that of most built-up wooden kits using ferrite motors.

Later flights showed that the Flash would be a most capable performer in the hands of an experienced pilot. Although flight times are relatively short (they would be closer to 3 or 3½ minutes with a heavier 1200mAh pack), I prefer to fly at this higher level of performance for 2½ minutes than to struggle along, barely flying, for 5 minutes. If you want performance, if you want to get into the air fast, and if you want to impress people who say "Electrics don't fly," then you should run right out and get yourself a Flash *today*.

**Here is the address of the manufacturer mentioned in this article:*

Great Planes Model Distributor, 1608 Interstate Dr., P.O. Box 4021, Champaign, IL 61820. ■

GIANT STEPS

(Continued from page 85)

build from kits or from plans, don't be afraid to try new ideas or to incorporate new building methods into your construction. Admittedly, some kits are difficult to alter in any significant way without going to a good deal of trouble. You can, however, add significantly to the integrity of any model through adopting some simple changes that require neither great skill or any significant amount of material, nor add any great weight to a model.

One of these changes is the addition of small plywood gussets to the fuselage joints. This works best if the fuselage consists of a sub-structure made of stick material. Small plywood gusset plates are added wherever two parts meet. While adding very little weight, the gussets add to the strength of each joint so treated, and add considerable rigidity to the structure, but resist any deformation of the designed shape. It's possible to eliminate fuselage cross-bracing through the use of gussets, and this often results in a net *loss* of weight. As a side benefit, the elimination of interior fuselage cross-bracing leaves the interior of the fuselage free for control-rod or linkage runs, which are often inhibited by diagonal bracing inside the fuselage.

When using light plywoods for parts, or skinning models, keep the scraps, as most are large enough to make gussets. I use 1/64- and 1/32-inch plywood scraps to make gussets in many shapes for this use. The beauty of these light materials is the ease with which they may be worked. The lighter grades of Finnish plywoods are easily cut with the usual modeling knives, a good pair of scissors, or an office paper cutter. This last method is one of the easiest, if a cutter is available to you. It's possible to cut parts of accurate shape quite easily with a cutter, and the edges remain straight and cleanly cut.

The shape of the parts used isn't important. Adding gussets takes only a very short time, including the time required to make them. I use CA to apply them, and the work goes very quickly. Adding gussets while the fuselage side is still fastened to the building board ensures proper alignment, and guarantees maintenance of this.

Light plywood gussets may be used anywhere in construction of any model. The weight of the material required to add a considerable number of gussets would be negligible in any but the smallest model, and the strength gained is quite significant. Consider that a piece of ¼-inch-square material glued upright to another amounts to only .062 square inches. The addition of a triangular gusset ¾ inch on the short sides adds over four

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Product News

MGA 1/4-SCALE PILOTS

MGA Enterprises has just come out with 1/4-scale busts that follow in the tradition of their previous pilots. These handsome busts are complete in every way. They're fully painted and finished, and their uniforms are detailed to match the planes they fly. Three models are available: World War I, World War II and a civilian sports pilot.

For more information, contact MGA Enterprises, P.O. Box 5631, Dept. P., Fresno, CA 93755.

R/C EXTRAS WEEKS SPECIAL BIPLANE

The new Weeks Special Biplane kit by Miles Reed is being introduced by R/C Extras. With a 6-foot wingspan and a 5-foot, 4-inch fuselage, the Special weighs in at 14 to 18 pounds, depending on the engine used. Engines of 2.0 to 3.1 cubic inches can be used. The kit includes all hand-cut plywood and balsa parts, plans and instructions, and the cowl canopy, landing gears and wheel pants are also provided.

For more information, contact R/C Extras, R.R. 1, Box 28B, Sergeant Bluff, IA 51054.

SUNSHINE HOUSE AERONCA

SunShine House has just published "Aeronca—The Best of Paul Matt,"—a comprehensive history of the Aeronca Corporation and its airplanes. The 96-page book is basically a reprint of short stories contained in Paul Matt's Historical Aviation Albums. The numerous personalities of Aeronca come alive with more than 160 photographs dispersed throughout this photo essay. Fourteen pages are devoted to Paul Matt's internationally acclaimed 3-view drawings of various Aeronca models, including specifications and descriptions.

For more information, contact SunShine House, Inc., P.O. Box 2065M, Terre Haute, IN 47802.

AMERICAN SAILPLANE DESIGNS WING BAGS

These wing bags are made of quilted, double-faced, tough, moisture-resistant material. They will protect wings from hanger rash, transportation bumps and sun fading. The bags come in several colors and sizes and can be ordered with custom embroidery, which may include your name, AMA number or whatever you choose. For more information, contact American Sailplane Products, P.O. Box 117 Dept. B, Nestor, CA 92053.

GREAT PLANES O.S. FS-91 SURPASS

O.S. is pleased to introduce its latest engine in the Surpass Series—the FS-91 Surpass engine. The FS-91 Surpass uses the latest technology to give a better performance than ever. In fact, the FS-91 Surpass has higher rpm ratings and 20 percent more horsepower than the FS-90 it replaces, but it weighs less. The 91 Surpass has a completely new design and, like the other 4-cycle engines in the Surpass family, it utilizes a helical gear-driven camshaft. For more information, contact Great Planes Model Distributor, 1608 Interstate Dr., P.O. Box 4021, Champaign, IL 61820.

COVERITE BALSARITE

Coverite announces that its popular Balsarite is now available in two different formulas. The original formula is still the modeler's favorite for use with fabric coverings and Coverite's Micafilm. The new formula is designed specifically for all iron-on films, e.g., Black Baron, MonoKote and Solarfilm. Both formulas go on with a light brushing that allows the Balsarite to sink into the wood. The new film formula can be easily identified in its green-and-white striped can, and both are available in half-pint and pint cans.

For more information, contact Coverite, 420 Babylon Road, Horsham, PA 19044.

CARL GOLDBERG MODELS EAGLE 2

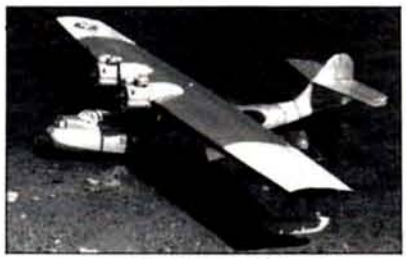
Carl Goldberg Models announces the new Eagle 2 sport-trainer. For five years, its predecessor, the Eagle 63, was America's favorite sport-trainer. The second-generation Eagle has the same easy-to-build, sturdy construction and forgiving flight characteristics that made the Eagle 63 so popular. The Eagle 2 features include realigned engine placement, redesigned tail, repositioned landing gear and an improved climb-to-glide transition. Molded hinges, a universal servo tray and an aileron torque-rod assembly have been included for easier construction.

For more information, contact Carl Goldberg Models, 4734 West Chicago Ave., Chicago, IL 60651.

IKON N'WST WACO TAPER WING

The 1/5-scale Waco Taper Wing is a replica of one of the most successful aerobatic biplanes from the golden age of aviation. Ikon N'Wst's 72.7-inch model is fully aerobatic with a 120R-4C. The kit includes inked drawings, select balsa and spruce, hand-cut parts, fiberglass cowl, pre-bent wire and a large hardware package. An optional rigging kit and photo documentation are available. This kit isn't intended for the beginner.

For more information, contact Ikon N'Wst, P.O. Box 306 Dept. MAN, Post Falls, ID 83854.



G&P SALES PBY-5A CATALINA

With an 84-inch wingspan, G&P Sales' PBY-5A Catalina is an impressive sight on the water. Twin .30- to .40-cubic-inch engines power the Catalina. The model is scale, except for a 10-percent increase in bow length and a 10-percent increase in the vertical fin height. These changes were made to improve water handling and in-flight lateral stability. The kit comes with joined fiberglass fuselage halves, foam wing cores and all the necessary wood. Formed landing gears are included for land use.

For more information, contact G&P Sales, 410 College Ave., Angwin, CA 94508.

MIDWEST PRODUCTS AERO-SPORTS

Three new sport model planes are now available from Midwest Products Co., Inc. The new Aero-Sports (.20, .40 and .60) are all strong, easy to build and give great flying performances. Because 90 percent of the wooden parts in each kit are pre-cut, construction goes quickly. Designed for the strength needed for high-G aerobatics and rough landings, all three Aero-Sports use a plywood-and-balsa box fuselage reinforced by triangular stock. The wings are built on hardwood spars surrounded by a fully sheeted D-tube leading edge. The Aero-Sports' wide speed-range capabilities permit everything from screaming, low, inverted passes to near-hovering flight.

For more information, contact Midwest Products Co., Inc., 400 S. Indiana St., P.O. Box 564, Hobart, IN 46342.

ROBBE MODEL SPORT BELL 222 UT

Robbe Model Sport introduces Schluter's new Bell 222 UT (utility) helicopter fuselage. The Bell is designed to fit the Schluter Junior 50 helicopter, and can also be adapted to fit the Schluter Mini Boy, GMP Cobra or the Miniature Aircraft Excell 50. The fuselage is made of lightweight fiberglass epoxy with an immaculate white gel coat. Included in the kit are clear plastic windows, die-cut wood and other hardware.

For more information, contact the Schulter Division at Robbe Motor Sport, 180 Township Line Road, Belle Mead, NJ 08502.

ACE R/C WHEEL PANTS

Ace R/C introduces the new Cap'n Eddy's Wheel Pants. These wheel pants are a quick and easy way to dress up your favorite airplane. Made from rugged .060-inch ABS plastic, they go together fast and paint up beautifully with any dope, enamel or epoxy.

Cap'n Eddy's Wheel Pants are packaged in pairs, and four sizes cover most requirements.

For more information, contact Ace R/C, Inc., 116 W. 19th St., P.O. Box 511, Higginsville, MO 64037.

Descriptions of new products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News,** or guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News.**

GIANT STEPS

(Continued from page 114)

and a half times to the glued area of such a joint. This doesn't even include the resistance to deformation brought to the joint by the addition of the gusset. The accompanying sketches will give you a good idea of how to make and use these light plywood gusset plates. Use your imagination and ingenuity. There are many other ways to use gussets to increase the strength and integrity of your models.

I'm out of space for this month. Hope to see you here again next time.

**Here are the addresses of the companies mentioned in this article:*

Experimental Aircraft Association (EAA), Whittman Air Field, Oshkosh, WI 54903-3086.

Balsa USA, P.O. Box 164, Marinette, WI 54143. ■

FLOATING AROUND

(Continued from page 93)

center section to one outboard panel and papered over the flap joints to totally obviate the flaps.

The wing has no spar bracing, apart from leading and trailing balsa edges. The wing's span strength comes entirely from Jerry's covering method, which goes something like this: Take the Sunday paper to your workshop. Mix 60 percent aliphatic carpenters' glue (the yellow kind) with 40 percent water. Wet sheets of newspaper with a spray bottle, and then paint the 60/40 glue mix onto the foam surfaces. Lay the damp paper onto the primed foam, "squeegy," and let it dry. When it's dry, seal the surface with one coat of polyurethane varnish, sand it lightly with 400 grit, and give it a finishing coat of varnish. For extra strength, Jerry used a double layer of newspaper two-thirds of the way out along the wing panels. He reports that the covering really beefs up the foam. Its only drawback is that it punctures quite easily, but repairs are a snap. As the paper dries, it stretches taut and hides imperfections. I'm dying to try this.

The Newspaper Maru is a really fine flier. After flying a couple of weekends, the consensus is that it handles a lot like the Robinhood 80. With a 114-inch wing, 64-inch fuselage, 51-inch floats, and Zenoah G38 swinging a 20/8 prop and Futaba* PCM Brain, the Maru weighs in at 22 pounds with a 28-ounce wing loading. The plane can fly slowly and turn flat with cross-controls, and it comes down nice and easy for solid landings. In the air, it takes a moderately heavy hand to move it around, and it's steady. At one point on the first weekend, Jerry went too far out and shut down in sheer panic. (He said he needed time to think!) In midair, the Maru seemed to stop and wonder what the next command would be. Gary Emerson grabbed the transmitter, firewalled the Maru, and it flew away as though nothing had happened! Jerry's already hard at work on another plane of this type, and he's also interested a buddy, so watch for more of these creations.

Memphis Prop Busters

In our gallery this month you'll find a picture of Memphis, TN, modelers Travis Coats and Milton Dickey running up Dickey's Scat Cat on Balsa USA* floats. The Memphis Prop Busters have held a float fly at their site every year since 1982. With its huge trailing water rudder for high-speed maneuvering around buoys, ventral fins on the floats for positive tracking in the air, and clean lines for reduced drag and lots of power, the Scat Cat looks like a potent performer for sea/air events. My apologies to Jim Prillman, who sent in a report on the float activities of this 135-member club. This is the only report I've lost in two years, and I found with with our tax records for 1986!

Float Warbirds

Finally, I have another report from Ed Westwood, in Spanaway, WA. Ed and I always lament the fact that float fliers aren't putting enough warbirds on floats. Here are a couple of shots to spur on our readers to do just that. The pictures of Steve Milo's Spitfire and Dave Schultz's OSE-1 were taken at the Portland Sky Night's annual Pine Hollow Float Fly. Ed also sent a video of the two planes in flight; the Spitfire is a great performer with a YS60, and the OSE-1 is awesome. Takeoffs happen as fast as Dave can advance the throttle, maneuverability on the water and in the air is tight and rock-steady, and the high-speed passes can make you shiver.

That's it for this month. I'm postponing a report on Paul Weston's new Sea Era until Bill Curry and I can get our hands on one of Paul's first kits. Till then, get wet and stay happy!

**Here are the addresses pertinent to this article:*

Ace R/C Inc., 116 W. 19th St., Box 511C, Higginsville, MO 64037.

Byron Originals, P.O. Box 279, Ida Grove, IA 51445.

Schneider Cup Event News, c/o Bob Martin R/C Models, 1520-C Acoma Ln., Lake Havasu City, AZ 86403.

Futaba Industries, 555 W. Victoria St., Compton, CA 90220.

Balsa USA, P.O. Box 164, Marinette, WI 54143. ■

AIRWAVES

(Continued from page 10)

Design Contest

I've been an R/C enthusiast for just over 10 years now, and I thought the MAN R/C Design Contest was a great idea. At the time, I didn't have any of my scratch-built projects ready. Hopefully, I'll have one to submit for this year's contest.

There was one entry, a pusher .25 F/A-18, which I thought would be great to build and fly. I was wondering if you could let me know the address of the contestant so that I could contact him and find out about obtaining a set of plans. Again, this contest is a great idea and shows how a little imagination can go a long way. Please continue to have this yearly.

Mike Magnacca
Columbus, OH

Mike, your timing couldn't be better! R.A. James' F/A-18 Hornet will be presented as a construction article in an upcoming MAN, *and we expect it to be an extremely popular design. I liked it so much that I'm building one myself.*

Glad you enjoyed our Design Contests; we're planning the next one right now!

RAU

Kit Source

As a teenager during World War II, I built and flew numerous rubber-band, scale, flying "stick" models (wingspan about 16 inches, tissue covered).

I'm trying to locate a source, catalog, or distributor for such model kits or plans.

Do you know where I might obtain these kits?: WW I Spad, Fokker, WW II Spitfire, Great Lakes Trainer, Piper, etc.

W. Morton
Pensacola, FL

Mr. Morton, you are indeed in luck! One of the leading kit manufacturers in the industry, Sig, is also the source for many kits of the type you're looking for. In addition to its own line of classic series kits, Sig also carries the stick-and-tissue kits by Comet and Peck-Polymers. Check out the Sig catalog, which is available directly from Sig Mfg. Co., Inc., 401-7 S. Front St., Montezuma, IA 50171. Another great source is Paul K. Guillow, Inc., P.O. Box 229, Wakefield, MA 01880; their line of kits is extensive.

RAU

(Continued on page 131)

NAME THE PLANE CONTEST

Can you identify this aircraft?

If so, send your answer to Model Airplane News, Name the Plane Contest (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.

Congratulations to John Belniak of East Aurora, NY, for correctly identifying the Indonesian NU-200 Sikumbang (Bee) in our September issue. John's entry was chosen from the three correct answers we received.

The prototype NU-200 was first flown on August 1, 1954 and was designed as a single-place, light, ground-support aircraft. Of mixed wood-metal construction, the Sikumbang used a 200hp D.H. Gypsy Six engine, which allowed a top speed of 160mph at sea level. The proposed armaments were two light machine guns and underwing ordnance. It apparently never reached production status.

The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail and will receive a free one-year subscription to Model Airplane News. If already a subscriber, the winner will receive a free one-year extension of his subscription.

AIRWAVES

(Continued from page 127)

Beech Comber

In *Model Airplane News*, April 1988, I read an article about the Beech King Air, built by Ray Torres. I'm interested in that model, and I'd appreciate it if you could tell me where I can get more information or where I can order the kit for that specific Beech King Air.

Hendrik Beukenboom
Utrecht, Netherlands

Hendrik, Ramon Torres' Beech C-90 King Air, with which he won the 1987 U.S. Scale Masters competition, was designed and scratch-built by Ray. I recently spoke with him and he informed us that a semi-kit of the King Air (glass fuselage, wing center section, templates and instructions) should be available around the end of this year. Contact Ray directly at R.T. Associates Corp., 4133 East 3rd Ave., Hialeah, FL 33013. Phone: (305) 871-3429.

RAU

Information Needed

I need some information that either you or your readers can supply. First, do you know of any kits or plans for the OV-10, the Marine Corps' twin-engine observation airplane? I saw an R/C version fly several years ago, but I haven't seen any kits or plans advertised. Second, can you supply me with the address of the Thorpe Brothers? I would like to get some of their excellent ducted-fan plans. Last, how about a Field and Bench Review of some of the Bob Parkinson

D.F. kits—specifically, the new F-18. Thanks for both your help and your great magazine!

Garrick Brivkalns
San Jose, CA

Garrick, I don't know of any kits for the OV-10, but we do have plan set No. 7 for a 70-inch version. This plan is from our September '68 issue, and it sells for $16.50, plus postage and handling. We'll save you some postage in your search for the Thorpe Brothers' ducted-fan plans: They're available from our old friend, Bob Holman, Box 741, San Bernardino, CA 92402.

We have a Field and Bench of both the Parkinson Regal Eagle and Blue Hornet in the works. At least one of them will appear in our upcoming "Jet" issue.

RAU

You Can't Please All the People...

Just received the August issue of your magazine. The title of the magazine is *Model Airplane News*, not model cars or helicopter.

I so look forward to the articles and hints, etc., and am disappointed with this issue. Let the helicopter enthusiasts have their own magazine; ditto with R/C cars and boats.

I've been involved for three years and have seen a dozen meets and—thank goodness—only two helicopters versus 300 airplanes.

Get back on the track. Give it to me with wings.

Richard Young
(Retired Curmudgeon)
Shamokin, PA

Another Satisfied Customer

First, let me say that I never could understand why my uncle (who is an R/C NUT!) always checked his mail for his next issue of your mag. I used to think, "Big deal, another model mag." Well, I've changed my thinking. And by the way, it's not just another model magazine, it's *the* model magazine! You can now find me waiting by the mail box for my next issue.

I'm a beginner in the wonderful world of R/C. I built a Goldberg Eagle 63, a very common, yet great, trainer. I also recently won the Model of the Month (Aug. '88) in my club—T.O.R.K.S. (The Oklahoma Radio Kon-

(Continued on page 142)

Beechcraft Model C17L **#P005**

North American P-51D Mustang **#P010**

Boeing B-17G **#P012**

P-51 Mustang
#P001

F4U Corsair **#P006**

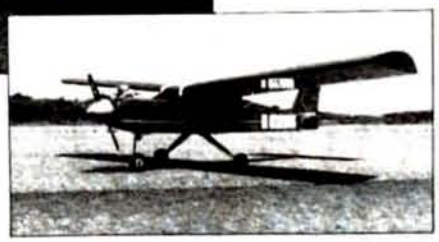
Republic P-47 D **#P007**

Mitsubishi A6M5 Zero **#P009**

P-40E Warhawk **#P004**

We now accept foreign orders!

COMING NEXT MONTH:



OUR "TRAINER" ISSUE, which we hope will provide the newcomer to R/C flying with some help in getting started:

- Field and Bench reviews will feature four different approaches to airplane selection.
- How the government trains *its* R/C fliers!
- What it takes to get started.
- Plus all your favorite columns like "Small Steps," "About Those Engines," "Golden Age of R/C" and all the other monthlies.

Watch for it!

ADVERTISER INDEX

AIRWAVES

trol Society). As a beginner, I'm grateful to everyone in my model club for the time they've taken to help me start on my way. Your magazine, with all the wonderful how-to articles and great reviews also helped me a lot. So I'd like to thank you and your staff for turning me into another R/C NUT!

See you at the field!

Robert N. Gambarelli
Oklahoma City, OK

At Sea with R/C

I'm in the Navy and I just recently discovered R/C modeling. I've been modeling plastics for a while and your magazine gave me the bug. I'm learning all I can about the hobby, and I'd like you to help me out.

I'm planning to buy an ARF for starters. Is this the right choice? With all the high-tech implemented on full-size aircraft, and everybody talking about "stealth" this and that, how come nobody comes up with a model representing these new planes? And if there *is* somebody, how come you don't show them in your magazine? What's wrong with flying wings?

Could you help?

Felix Donato
FPO San Francisco

Felix, thanks for writing! In our next issue, we'll talk about trainers and, I hope, provide direction for the many newcomers like you, who want to get started.

I'm sure some readers will disagree, but since you asked for our *opinion, here it is:*

An ARF, properly chosen and equipped, can be an excellent first airplane for the beginner who cannot find the time (or simply may not have any inclination) to build the airplane. Some may argue that you can't find an ARF with a light enough wing loading—that's simply not true. "Light enough" is relative. It may not even be worthy of consideration; after all, many powered gliders have extremely light wing loading, but they don't necessarily make good flight trainers. A good trainer should be easy to fly, but capable of being more than guided around. Most important, it should give the budding flier confidence. We'll explore this in detail in the December issue.

Someone has *come up with a representative stealth airplane, and we have shown them. Problem is, if you read* MAN *near a microwave, you just can't see them!*

Nothing's wrong with flying wings. Why do you ask? Northrop loves them. Check out the new B-2?

RAU